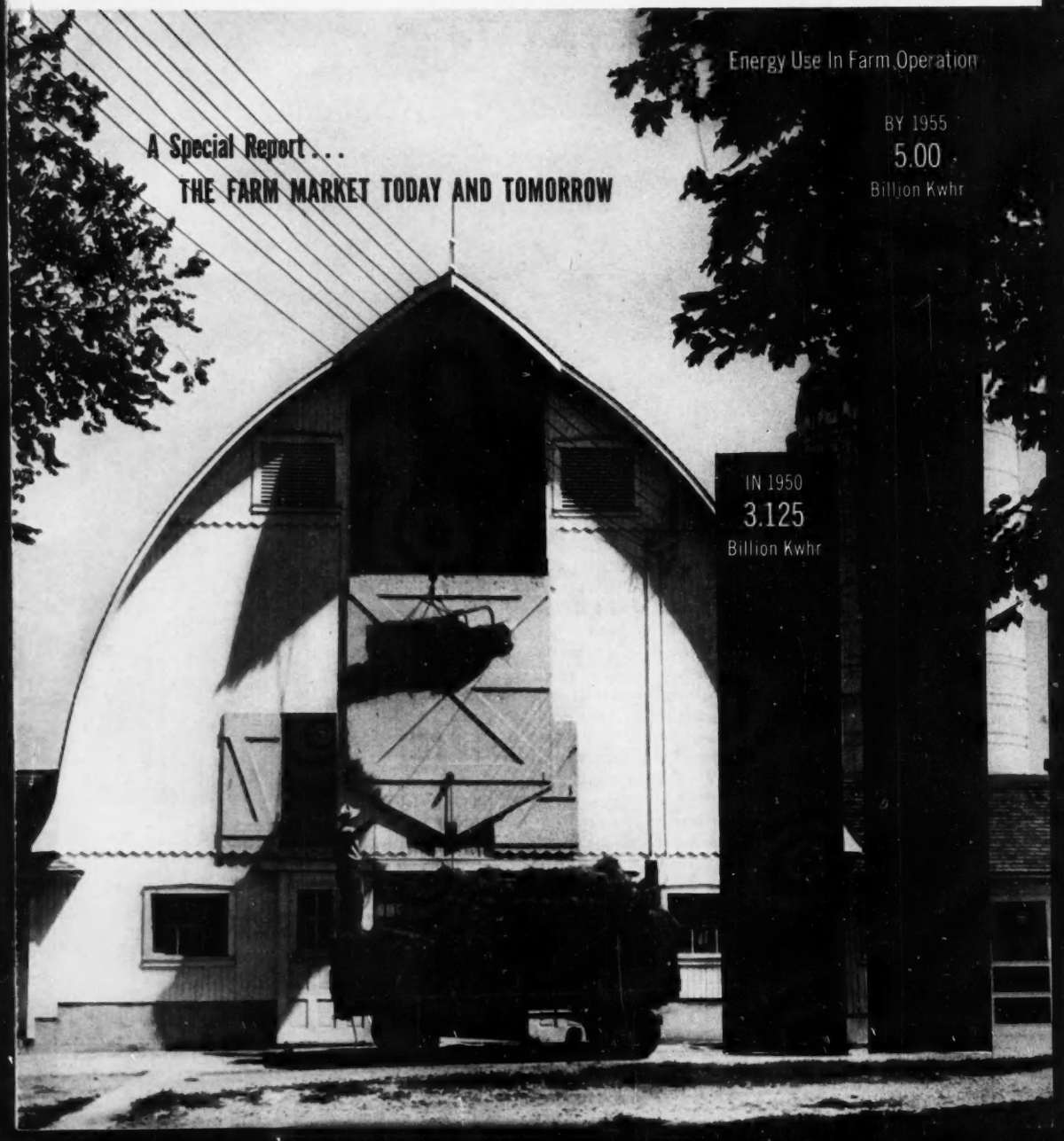
DECEMBER 3, 1951

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



A Special Report . . .
THE FARM MARKET TODAY AND TOMORROW

Use the turbine oil that has 10 TIMES MORE OXIDATION RESISTANCE

use TEXACO REGAL OIL (R&O)

To prevent rust, sludge and foam in your turbine lubricating system, use *Texaco Regal Oil (R&O)*. This is the world-famous Texaco Regal Oil *improved* with special Texaco additives and processing. Tests prove it *more than ten times as resistant to oxidation* as ordinary turbine oils, and far superior in preventing rust, sludge and foam.

When you use *Texaco Regal Oil (R&O)* you can count on: 1) clean turbine lubricating systems; 2) normal bearing temperatures; 3) instant governor response; and 4) an extra-long oil service life.

There is a complete line of *Texaco Regal Oils (R&O)* to bring you these benefits no matter what the type or size of your turbines. *Texaco Regal Oils (R&O)* meet the stringent requirements of all leading turbine builders.

Let a Texaco Lubrication Engineer help you improve turbine performance and reduce your maintenance costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 E. 42nd St., New York 17, N. Y.

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL TURBINES

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

NOTES ON THE NEXT ISSUE

When the Memphis Light, Gas & Water Division decided to install high-pressure, oil-filled, pipe-type cable in its downtown underground system, they proved that good things come in mighty big packages, too.

For, contrary to usual practice, the contract was let to a single firm and called for a complete cable circuit in place, which is ordering a pretty big package.

The result is an excellent system at a lower-than-usual price.

According to John C. Parker, Supervisor of the division's Insulation Test Department, who tells the full story in the forthcoming (December 17) issue of Electrical World, this is a practical way to buy pipe type cable systems. The saving was possible because of complete plans and specifications, carefully and accurately prepared, and because the job was given continuous and detailed inspection and thorough tests were made on all work and materials.

LIGHTING OF CONTROL CENTERS

Modern control centers have a tendency to become more and more complicated—to seek an ever-smaller minimum number of operators who control an ever-growing plant area.

And it follows quite naturally that the lighting of control centers assumes an increasing importance.

V. L. Dzwonczyk, Operating Sponsor, American Gas & Electric Corp, feels that control room lighting should be designed on the basis of the visual task at hand. According to him, the best possible utilization of the many available new light sources can be brought about, and the cost kept to its right proportions. He tells how in Electrical World for December 17.

METER STANDARDS?

W. M. Howe, of General Electric's Meter and Instrument Department, feels there are many appreciable benefits to be realized from standardizing demand meters. A few of them:

Reduced inventories for both utility and manufacturer; shorter delivery time; more accurate and reliable equipment; reduced first cost, and several more.

He states his case—a pretty important one—in an interesting and forceful manner in the December 17 issue of Electrical World.

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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FEATURE

Future Farm Market ..... Frank R. Innes 103

Special study provides data on market for electricity and electrical goods in farm production operations, a field in which definite figures had previously been practically non-existent. Survey of makers of electrically-operated farm equipment provides basis for estimates of 1951-1955 market of $500 million for products of electrical manufacturers and near doubling of present energy use

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Dual Sheath: Okometal of Reduced Thickness Plus Okosheath Protective Covering.

# of lead covered paper insulated cables

TWO-THIRDS of all cable failures are due to corrosion and mechanical damage. Okonite-Callender's cable design of Okometal of reduced thickness plus Okosheath Protective Covering specifically combats these two causes.

OKOSHEATH PROTECTIVE COVERING IS THE ANSWER TO CORROSION

Many corrosion preventives have been tried in the past, such as cathodic protection, protective greases, saturated fibrous or jute coverings. All, however, have very definite limitations. Only Okosheath Protective Covering meets the severe conditions imposed by duct or underground use. *In 18 years, no case of sheath corrosion has been reported on any cable having Okosheath Protective Covering.*

OKOMETAL PLUS OKOSHEATH PROTECTIVE COVERING IS THE ANSWER TO MECHANICAL DAMAGE

Okometal possesses unusual fatigue-resisting properties. This alloy was developed in the Okonite laboratories, with time-proved sodium-stabilized lead as a base. Under lab tests simulating actual man-hole bending, for example, *Okometal outperforms copper-silver-bearing lead close to three times!*

If you do not have all the facts on Okometal of reduced thickness plus Okosheath Protective Covering, get in touch with your Okonite representative today or write for your copy of Bulletin EW-1047R. The Okonite Company, Passaic, N. J.

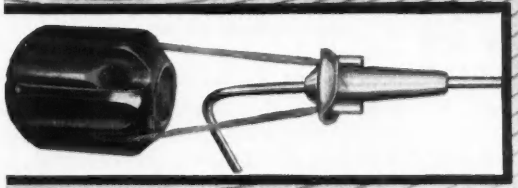
OKONITE-CALLENDER paper insulated power cables

Electroline

AUTOMATIC DEAD-ENDS

"AS GOOD AS NEW" AFTER TORTURE TEST

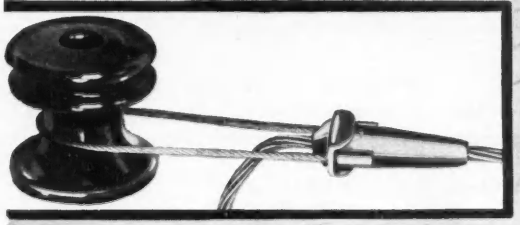
Electroline AUTOMATIC DEAD-ENDS are continually subjected to gruelling tests for strength, gripping and vibration damping features. In a typical test, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these dependable Dead-Ends. Month after month, day and night, these Dead-Ends held their positive grip and retained the full strength of the conductors. Engineers compute that the Dead-Ends withstood the equivalent of 50 years of ordinary service and state that they were as good as new at the end of the test.



3400-SERIES

The 3400-SERIES consists of an Electroline Automatic Connector, a yoke and flexible bail. These three are permanently interlocked once the conductor is inserted to form a complete unit that fits either strain or spool-type insulators.

This series permits the feeding of the conductor through the connector, eliminating the use of taps in the line span. The damping features incorporated in Electroline Dead-Ends prolong the life of conductors by preventing crystallization at the point of connection. They insure full line strength and save on construction costs by their quick and easy installation. These economical Dead-Ends can be reclaimed and used again. But, once installed, the conductor is there to stay; it cannot become detached until released by a lineman.



FOR COMPLETE DETAILS WRITE FOR BULLETIN.

TALENT TO ORIGINATE E ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

In Canada: POWERLITE DEVICES, LTD., TORONTO

Alduti Interrupter Switches

PERMIT ARC-FREE

The practice of mounting sectionalizing switches upright to provide arc clearance is often inconvenient and costly. This is especially true where a vertical conductor configuration is used. In this case, the transposition of conductors into the horizontal plane for pole top switching requires a longer span and a higher pole; and the wide spacing demanded by horn gap switches often results in a costly supporting structure.

On the other hand, with the installation of an Alduti Interrupter Switch vertical conductor configuration, regular span lengths and regular pole height can be retained. In many cases the installation can be made on an existing line pole, and no switch supporting structure other than the pole itself is needed.

Because Alduti Interrupter Switches operate without external arcing there is no limitation imposed on line design to provide arcing clearance for switches. Switch configuration can conform to the configuration of the line. This opens the door to development of "unconventional" improvements in switch mounting techniques, of which the illustration is a typical example.

Yet these structural advantages are but part of the story. With interrupter switches you are no longer restricted to present sectionalizing practices. Feeders and branch lines can now be safely switched without sequencing with breakers or dropping individual loads —because Alduti Interrupter Switches interrupt not only line or cable charging currents, but also 600 amperes of load current.

Why not discuss with your S&C sales representative the advantages of this new kind of sectionalizing switching.

Alduti Interrupter Switches are supplied in the following ratings:

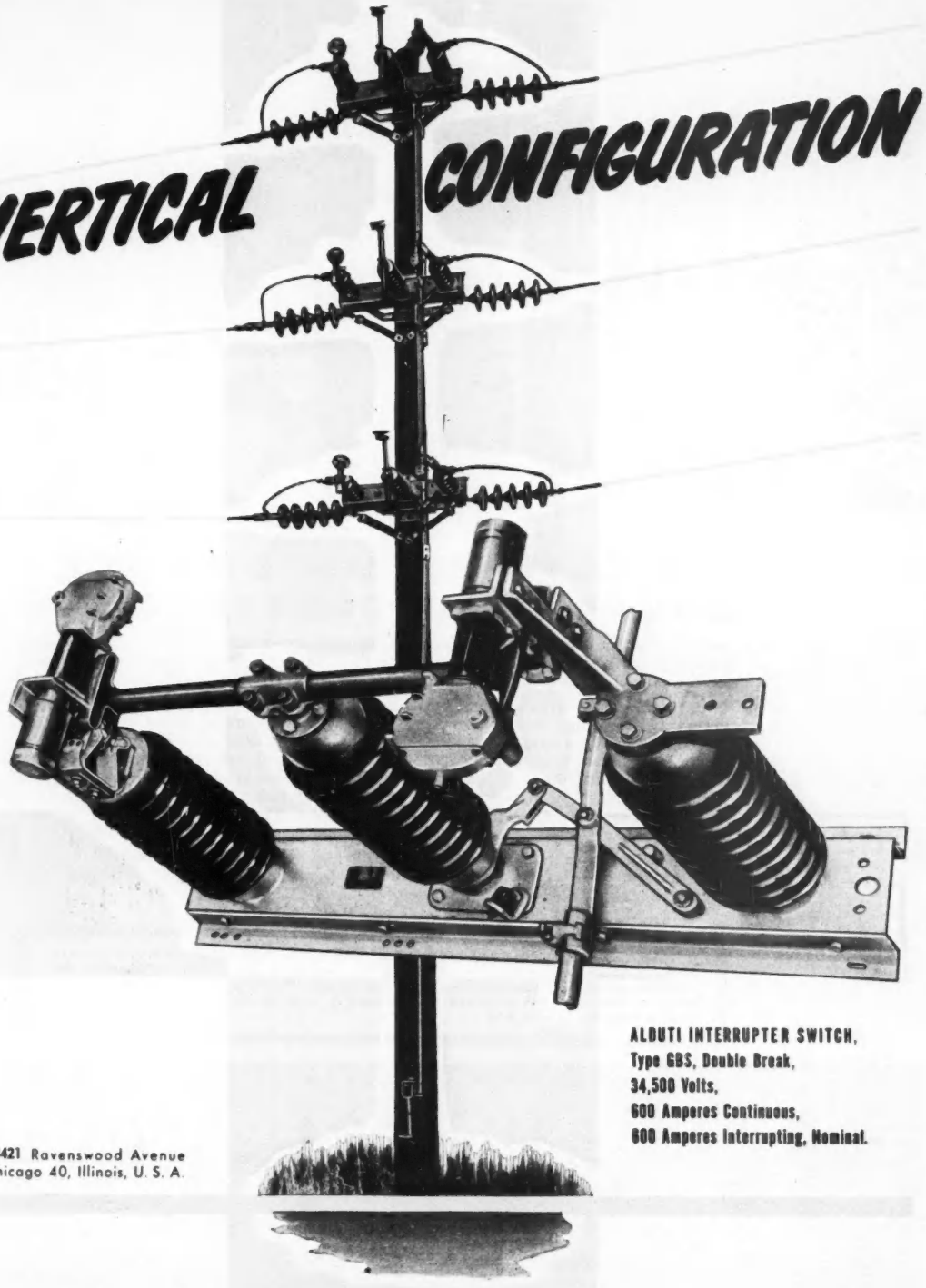
Volts	Amperes Continuous	Amperes Interrupting, Nominal
For hook stick or group operation		
7500 & 15000	400, 600, 1200	400, 600
For group operation only		
23000 & 34500	600	600

S&C ELECTRIC COMPANY

Formerly SCHWEITZER & CONRAD, INC.

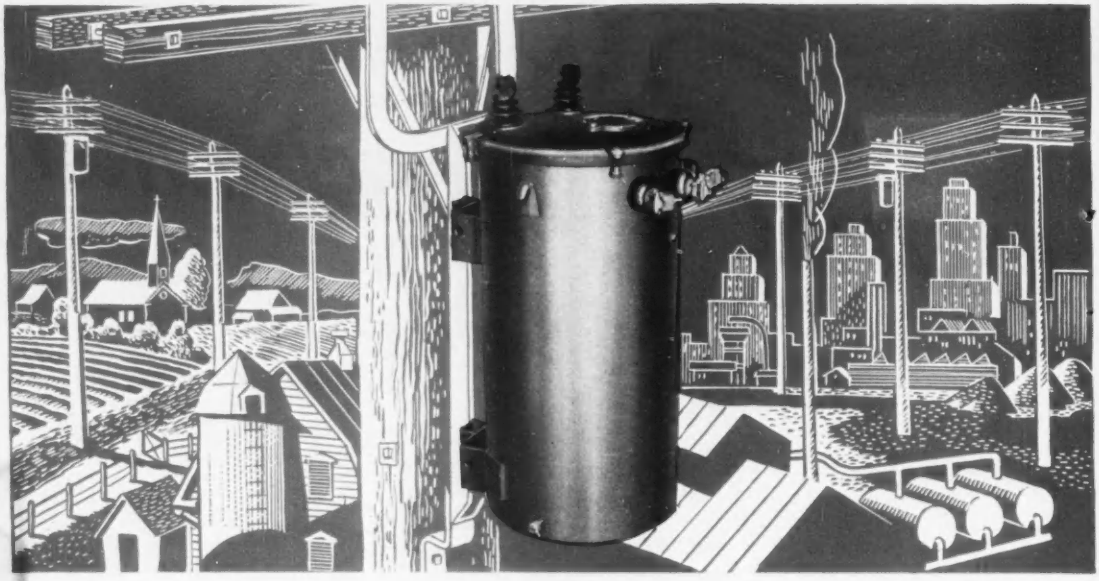
In Canada, Powerlite Devices, Limited, Toronto

VERTICAL CONFIGURATION



ALDUTI INTERRUPTER SWITCH,
Type GBS, Double Break,
34,500 Volts,
600 Amperes Continuous,
600 Amperes Interrupting, Nominal.

4421 Ravenswood Avenue
Chicago 40, Illinois, U. S. A.



IT COSTS NO MORE TO BUY SOUND BASIC CONSTRUCTION

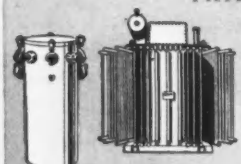
● Today, at The Standard Transformer Company, top-quality transformers are being produced for distribution systems all over the world — with no sacrifice of material for the sake of unimportant claims.

● Examine the Distribution Transformers illustrated on the right-hand page. Notice the easily removable cover, moisture-proofed with a Neoprene gasket to prevent oil leakage . . . note the rugged copper-bearing steel tank housing a low-loss core assembly of non-aging, varnish coated, silicon steel sheets . . . a coil that is wound in two sections to double heat radiation . . . ends that are not blanketed to induce free and effective oil circulation . . . a well-designed core clamping that assures quiet and efficient operation. These are some of the features that make Standard Transformers the best in their field.

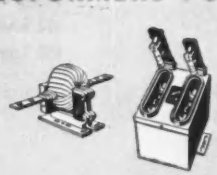
● It pays to buy sound basic construction. When you need transformer information, write for the name of your nearby Standard representative. He will help you with your selection, and describe our service fully.

. . . and remember . . . The Standard Transformer Company has built its reputation as a specialist in the design of transformers for every need. ● You write the ticket . . . Standard engineers and craftsmen comply with your specifications or requirements. You have complete freedom in your choice of accessories, such as Cubicles or Switchgear for Load Center or Substation Transformers, or other types that require them.

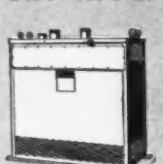
TRANSFORMERS FOR EVERY APPLICATION



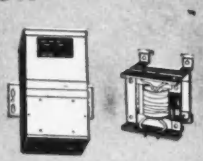
Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)



Instrument transformers (for use on circuits up to 72,000 volts, inc.)



Dry type (up to 1000 KVA and max. voltage ratings of 4800)



Control transformers (compound filled or open type)

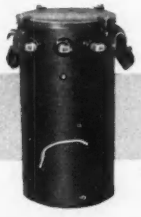
Standard

TRADE MARK ®

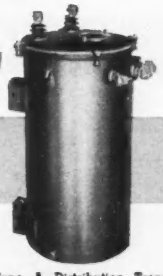
DISTRIBUTION TRANSFORMERS

● Shown here are seven liquid filled Distribution Transformers 7½ to 75 KVA. Standard manufactures a complete scale of Transformers up to 15,000 KVA.

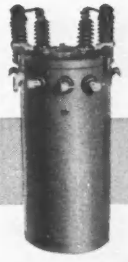
Type A Distribution Transformer, single phase, 60-cycle, sizes through 7½ KVA, voltages 2400/4160Y to 120/240, with pocket mounted, high voltage bushings.



Type A Distribution Transformer, single phase, 60-cycle, sizes of 10 and 15 KVA, voltages 2400/4160Y to 120/240 or 240/480, with pocket mounted, high voltage bushings

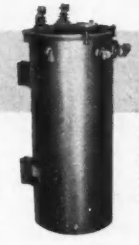


Type A Distribution Transformer, 37½ KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings.



Type CSP (completely self-protected) Distribution Transformer, 15 KVA, 7200/12470Y to 120/240 volts, 60-cycle, single phase with cover type high voltage bushings. ASA standard

Type CSP (completely self-protected) Distribution Transformer, 15 KVA, 2400/4160Y to 120/240 volts, 60-cycle, single phase with two pocket type high voltage bushings ASA standard



Type A Distribution Transformer, 50 KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings

Type A Distribution Transformer, 75 KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings.

Write for Bulletins covering the complete Standard line.

THE STANDARD TRANSFORMER CO.

WARREN • • • OHIO

(REPRESENTATIVES IN PRINCIPAL CITIES)

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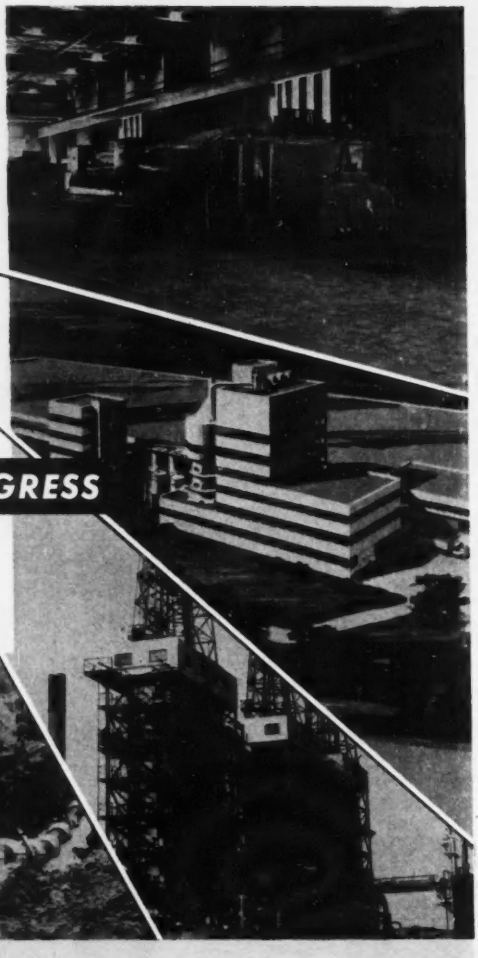
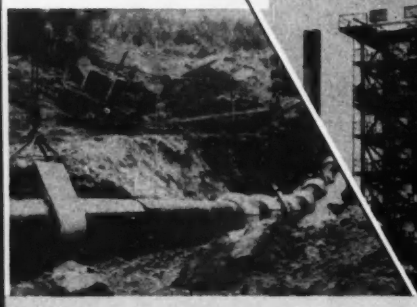
Engineering · Construction

PACEMAKERS OF PROGRESS





Natural resources harnessed to man's use,

...power, processing and industrial plants producing the essentials of life,

...pipe lines, piers, railroads and highways for the transport of men and goods

are some of the contributions to progress made by Bechtel engineering and construction in the service of industrial clients.

Experience in depth in all of these and related fields is available promptly, wherever needed.

BECHTEL CORPORATION

BUILDERS FOR INDUSTRY

SAN FRANCISCO

Los Angeles · New York

MOLONEY VOLTAGE REGULATING APPARATUS . . .

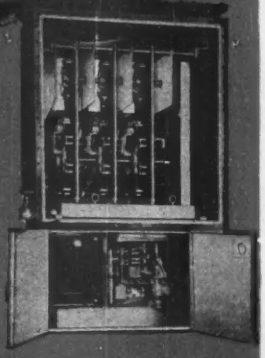
. . . THE ANSWER TO YOUR REGULATION PROBLEMS!

Moloney Step-Type Feeder Voltage Regulators, Regulating Transformers and Load Ratio Control Transformers have been chosen by many system engineers to solve their regulation problems after considering the following advantages of Moloney Load Tap Changer with which they are equipped.

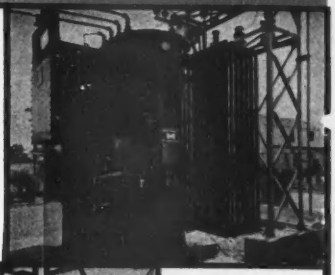
1. RELIABILITY . . . The tap selector switch is mechanically driven by Geneva gears to assure correct positioning. Arcing is prevented on this switch since the load transfer switch assumes the entire load before the selector switch contacts are opened and maintains this load till after the selector switch contacts close in the next tap position. The load transfer switch, which is the only switch required to transfer load current, is provided with accelerating springs and is driven by Geneva gears. This assures quick break of the current arc.

2. LOW MAINTENANCE COST . . . Contacts which transfer load current are accessible for inspection and maintenance through an access opening in the Load Tap Changer compartment cover. Arcing duty is imposed on only four stationary contact tips per phase as contrasted with eighteen in mechanisms performing both tap selection and load shifting duties on the same contacts.

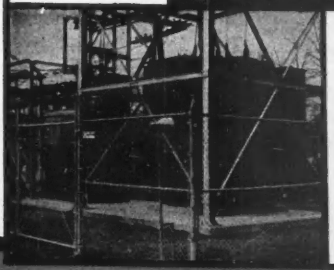
3. LOW LOSSES . . . The Moloney Load Tap Changer incorporates an ingenious method of by-passing the switching reactor to eliminate reactor copper losses. These losses are eliminated in all operating positions on 1¼% step apparatus and in half of the positions on ⅝% step apparatus.



Moloney three-phase Load Tap Changer with automatic controls. Tap assembly contains Tap Selector Switch, Load Transfer Switches and Reversing Switch. Motor drive and auxiliary equipment are at lower right. Automatic controls are at lower left. Moloney Automatic Control equipment features a super-sensitive voltage regulating relay and an electronic time delay circuit. A complete line of remote-manual and automatic controls and associated equipment is available.



Load Ratio Control Transformer rated 3000 Kva, 13200 volts Delta to 4330Y/2500 volts, equipped with automatically controlled Load Tap Changer.



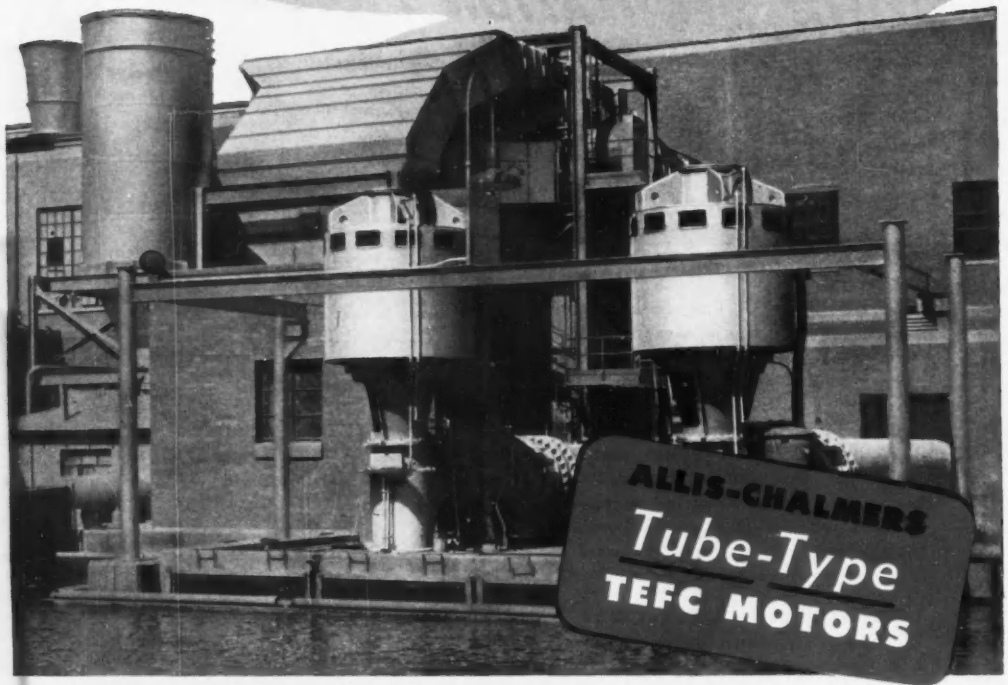
Load Ratio Control Transformer rated 3000 Kva, 13500 volts Delta to 4330Y/2550. Load Tap Changer equipment provides plus or minus 10% regulation in 32-⅝% steps.

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Open Sky
IS ALL THE ROOF THEY NEED



● Southwestern Public Service Corporation's installation of Allis-Chalmers 400-hp, 870-rpm vertical *tube-type* TEFC motors driving Allis-Chalmers pumps at Amarillo, Texas.

What does it cost to house a motor? Nothing — if it's an Allis-Chalmers *tube-type* totally-enclosed fan-cooled motor. Then the sky is roof enough. And it need not be blue sky either.

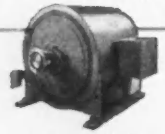
These motors aren't afraid of fog, rain, snow, salt, coal dust, soot, alkalies, or mild acids in the air. They're built to take care of themselves . . . and to save you money. The opportunity for low installation cost is only the beginning. Peak reliability and low maintenance pay worth-while dividends throughout the long life of the motors.

Why? Because their *tube-type* air-to-air heat exchanger design offers you these advantages:

1. *Self-cleaning action* . . . result of generous flow of outside air through smooth, straight cooling tubes.
2. *Complete enclosure* . . . protects stator core and other electrical parts from dirt and corrosion.
3. *Full internal air circulation* . . . provides efficient, even cooling—makes large sizes practical.

These are proved advantages, for purchases have exceeded 170,000 hp in sizes from 250 to 2500 hp. Introduced in 1946, *tube-type* motors are now available down to 40 hp at 600 rpm.

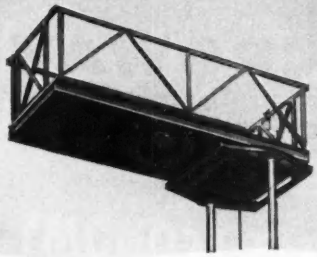
Bulletin 05B7150 describes these motors that are equally at home indoors or out. Call your A-C representative, or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3534



Also available in horizontal designs.

ALLIS-CHALMERS

"The Accepted Standard with Utilities Everywhere"



Proved by many years of trouble-free service, *Powers-American* bodies set the pace as the number one choice with utilities everywhere . . . the measurement of top quality and performance throughout the industry. "Job-engineering" steps up crew efficiency, lowers operating costs . . . protects your investment. *Powers-American* has the type body and equipment to do your particular job most efficiently and at lowest cost.

HYDRAULIC TOWER

Platform extends to 30′ above ground and can be revolved full 360°. Operation is controlled from truck cab or by workman on platform. Models are also available in ground-to-platform heights of 21′ and 25′ for installation on chassis having a rated capacity of 1½ tons or more.

LINE CONSTRUCTION BODY (600)

Available in 9′ to 14′ lengths, equipped to meet individual needs in any phase of utility work.

REVOLVING AERIAL LADDER

Models available in working heights of 23′ 6″, 26′ 6″, 30′ 6″, and 32′ 6″ for all styles of bodies.

LIGHT CONSTRUCTION BODY (SERIES 35)

Ideally suited for all types of light duty maintenance and construction work.

MAINTENANCE BODY (400)

Designed for medium duty general service. May be furnished with winch and derrick capable of handling 40′ poles.

POWERS *American* DIVISION

ACB

PUBLIC UTILITY BODIES AND EQUIPMENT

McCABE-POWERS AUTO BODY COMPANY
5901 North Broadway, Saint Louis 15, Missouri

There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

PHILCO

Advanced Design MICROWAVE

COMMUNICATIONS SYSTEMS

ENGINEERED FOR GREATEST ECONOMY!

Philco *Advanced Design* Microwave Systems are unsurpassed in reliability, performance and economy. They are designed to give you the greatest value for your communications dollar!

Finest quality components, conservatively rated, insure long life and economy of operation and maintenance. Years of production experience enable Philco to produce microwave systems for the lowest possible cost consistent with highest quality.

Philco *Advanced Design* Microwave is flexible. The broadband microwave channel may be divided to carry up to 24 simultaneous 2-way telephone conversations . . . or be further divided for telegraph, teletype, telemetering, signaling or supervisory circuits. Future expansion can be easily accomplished with no loss of original investment.

Philco *Advanced Design* Microwave Systems give you maximum reliability . . . plus *low cost* installation, operation and maintenance. *Don't settle for Less!*

PHILCO CORPORATION

INDUSTRIAL DIVISION

PHILADELPHIA 34, PENNSYLVANIA

HOW TO GET MORE OUT OF YOUR PLANT...

You can step up production in your plant—*without any additional capital outlay*—by increasing machine efficiency, improving materials-handling, and instituting programs for personnel training and quality control.

Socony-Vacuum can assist you in all of these operations. Our program of Correct Lubrication — based on 85 years' experience working with industry — includes . . .

- Analysis of all your production, power-generating and materials-handling machinery.
- Recommendations of the right oils and greases for every moving part of all your machines . . . and for rust and corrosion prevention.
- Training for your lubrication personnel.
- The full facilities of our research laboratories, and the services of our staff of lubrication engineers—largest in the industry.
- Progress reports on the production benefits gained through improved lubrication.

Why not get more out of *your* plant — with Correct Lubrication? Call your Socony-Vacuum Man.

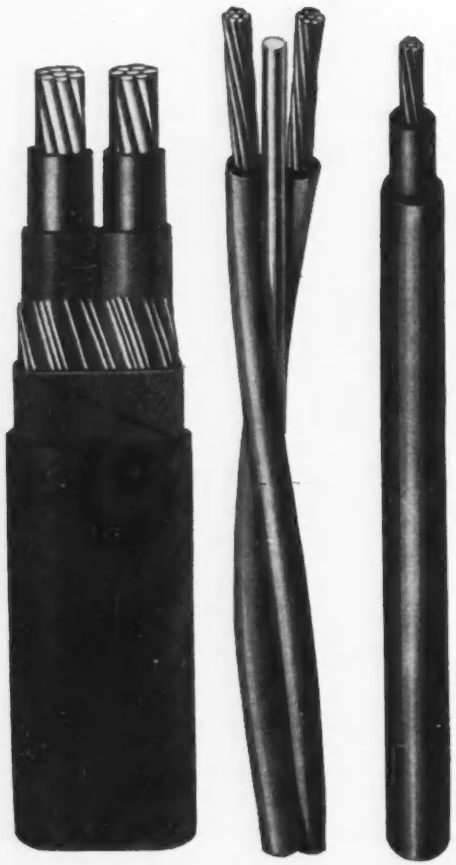
Socony-Vacuum

Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

SERVICE ENTRANCE CABLES



TYPE SE TYPE SS TYPE USE

Roebling makes a wide line of service entrance and service drop cables

SERVICE CABLES are an important part of Roebling's complete line of electrical wires and cables. Whatever your requirements for getting electrical energy from the utility's secondary to the meter, the right Roebling underground or overhead cable will give you the fullest measures of dependability...and economy.

All types and styles of Roebling Service Entrance Cable are made in the constructions best adapted for their own particular service range. From copper wires to protective jackets these cables are made entirely in Roebling plants where modern machines and methods assure highest, uniform quality.

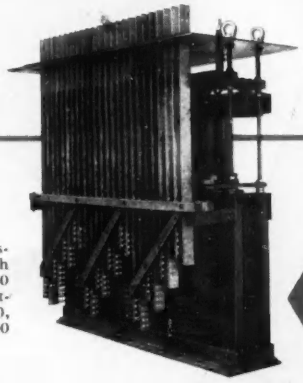
A large part of Roebling's complete wire and cable line is required in today's rearmament program. You can count on the Roebling organization and distributors, however, to give you the best possible delivery service. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***

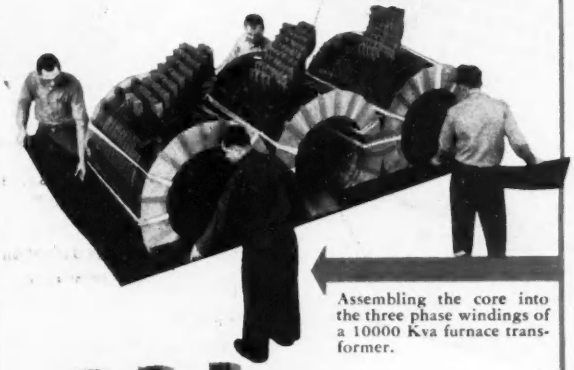
NOW *15 years of Proof*

behind the design of each PENNSYLVANIA FURNACE TRANSFORMER



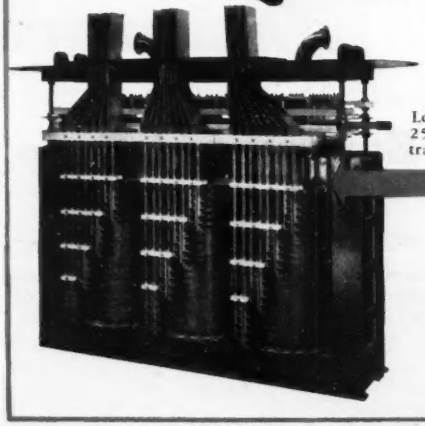
2500 Kva Transformer; High voltage — 3300 volts; Low voltage — 140, 130, 120, 110 and 100 volts.

Fifteen Years Ago... Pennsylvania Transformer Company introduced a new type of helical winding in the low voltage coils of a 2500 Kva furnace transformer. Since then, Pennsylvania has manufactured over 1¼ million Kva of furnace transformers using the same fundamental principles of design employed in this 2500 Kva unit.



Assembling the core into the three phase windings of a 10000 Kva furnace transformer.

In all the intervening years, there has *never* been a low voltage winding breakdown on any of these furnace transformers. Because this design is basically and fundamentally correct, Pennsylvania can build furnace transformers for any size electric furnace now being manufactured or being contemplated for future construction.



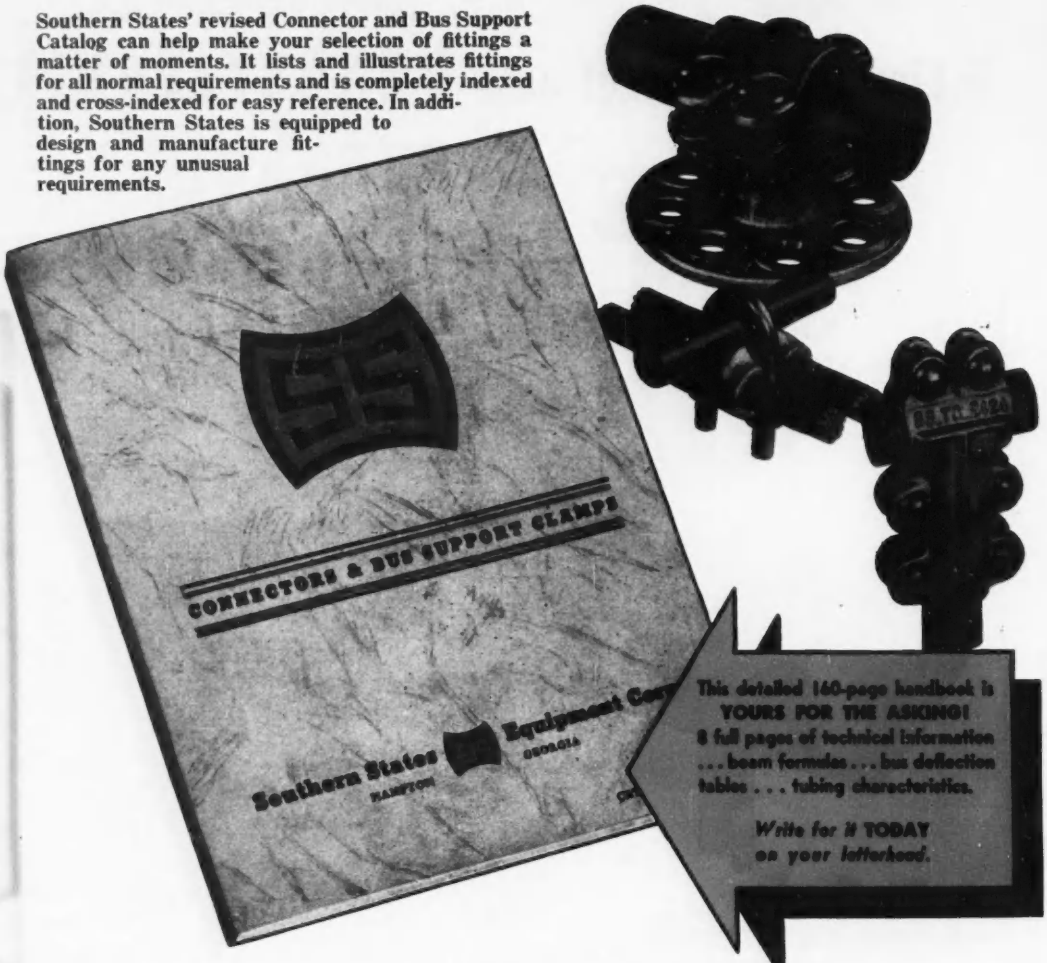
Low voltage side. 25000 Kva furnace transformer.

Pennsylvania TRANSFORMERS

Pennsylvania
TRANSFORMER COMPANY
CANONSBURG, PA.
Greater Pittsburgh District

ONE STOP SERVICE...
For CONNECTORS and BUS SUPPORTS

Southern States' revised Connector and Bus Support Catalog can help make your selection of fittings a matter of moments. It lists and illustrates fittings for all normal requirements and is completely indexed and cross-indexed for easy reference. In addition, Southern States is equipped to design and manufacture fittings for any unusual requirements.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This detailed 160-page handbook is YOURS FOR THE ASKING! 8 full pages of technical information ... beam formulas ... bus deflection tables ... tubing characteristics.
Write for it TODAY on your letterhead.

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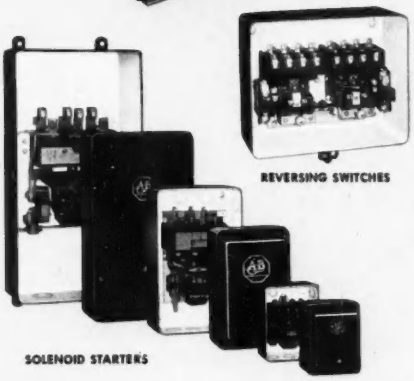
Your HANDY BUYING GUIDE

FOR SELECTING MOTOR CONTROLS



REVERSING SWITCHES

SOLENOID STARTERS

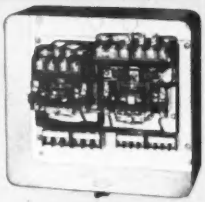
Have you one of these Handy Catalogs on your desk? If not, let us send you a copy.

This 92-page handbook on motor controls is written for the busy man who regularly specifies or buys manual or automatic starters, push buttons, limit switches, relays, timers, and other control components.

It is a valuable guide with dimensions, ratings, and prices, all arranged for quick and easy use. No matter what kind of control problem, whether manual or automatic, a.c. or d.c.—the Allen-Bradley Handy Catalog will help you.

The heart of the Allen-Bradley line is the time-tested A-B solenoid starter. It has maintenance free, double break, silver alloy contacts. Its simple one piece solenoid mechanism is trouble free. For quality control, specify Allen-Bradley.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.



MULTISPEED STARTERS

COMBINATION STARTERS

AUTO TRANSFORMER STARTERS

STARTERS FOR SMALL MOTORS

MANUAL STARTERS

TIMING RELAYS

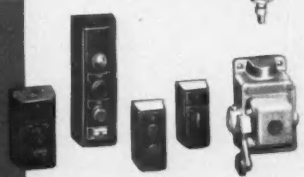
RELAYS AND CONTACTORS

PUSH BUTTONS • LIMIT SWITCHES • PILOT LIGHTS • FLOAT SWITCHES • ACCESSORIES

ALLEN-BRADLEY

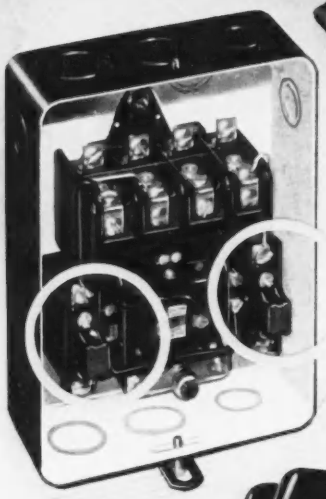
TROUBLE FREE MOTOR CONTROLS

QUALITY



B51-M

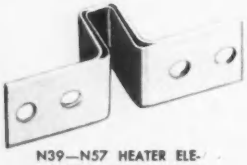
BULLETIN 709 SOLENOID MOTOR STARTERS...



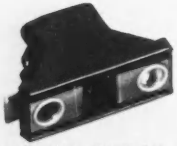
Check heater elements before mounting them in the overload relays.

FOR *Reliable* OVERLOAD PROTECTION

be sure to use the correct Heater Elements



N39—N57 HEATER ELEMENTS for motor full load currents 25 to 157 amp.



N17—N38 HEATER ELEMENTS for motor full load currents 2.68 to 22.9 amp.

NN4—N16 HEATER ELEMENTS for motor full load currents 0.19 to 2.41 amp.

Every Bulletin 709 solenoid starter has two reliable overload relays. The heater elements are supplied separately. Before installing a new starter, double check the heater elements—first, by noting their current rating as listed inside the starter cover;—second, compare this rating with the full load current rating of the motor. When these figures correspond with each other, you are assured of the most reliable overload protection. For complete safety for man, motor, and machine, always specify Bulletin 709 solenoid starters.

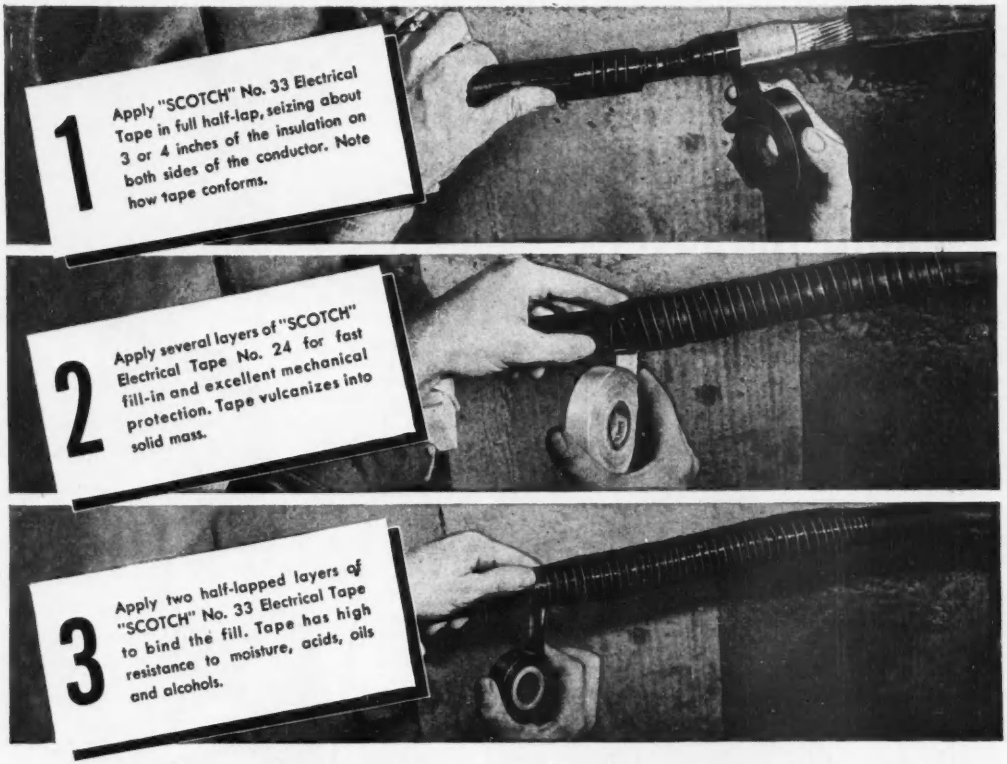
Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

851-M

ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

QUALITY


1
Apply "SCOTCH" No. 33 Electrical Tape in full half-lap, seizing about 3 or 4 inches of the insulation on both sides of the conductor. Note how tape conforms.
2
Apply several layers of "SCOTCH" Electrical Tape No. 24 for fast fill-in and excellent mechanical protection. Tape vulcanizes into solid mass.
3
Apply two half-lapped layers of "SCOTCH" No. 33 Electrical Tape to bind the fill. Tape has high resistance to moisture, acids, oils and alcohols.

CABLE SPLICING COSTS CUT 50%

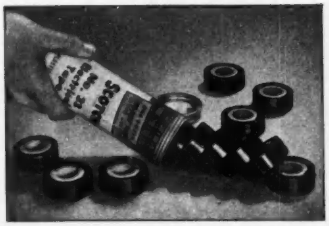
New, easy method employed with "SCOTCH" Electrical Tapes at world's largest soy bean plant in Illinois

No more need for clumsy coating materials on this kind of splicing job! Neoprene-jacketed 500 MCM Anhydrex cables are butted together in a copper sleeve, soldered, and wrapped with two "SCOTCH" Electrical Tapes as shown above. McCarthy Bros. & Ford, contractors on the job, estimate a saving of 50% in time and material at Spencer Kellogg & Sons—soy bean processors in Decatur, Illinois.

"Just any" tape wouldn't work. Chemicals in the air (such as hexone and industrial oils) caused insulation failure in a very short time. That's why this experienced contractor *specified* "SCOTCH" No. 33 Plastic Electrical Tapes.

There are dozens of these stick-at-a-touch "SCOTCH" Electrical Tapes—each designed to do a specific job *right*—Plastic tapes, glass cloth tapes, Acetate tape, treated paper tapes. Many of these tapes are available with thermosetting adhesives.

Why not take the free help of tape experts? Show us your problem, and we'll show *you* how "SCOTCH" Electrical Tapes can save! Write Dept. EW111 today.



QUICK FACTS ABOUT "SCOTCH" NO. 33 ELECTRICAL TAPE

- TOUGH—plastic backing resists abrasion, water, oil, alkalies, alcohols.
- STRETCHY—conforms to any surface.
- HIGH DIELECTRIC—10,000 volts.
- THIN CALIPER—only .007 inch thick.
- WON'T DRY OUT.

SCOTCH BRAND Electrical Tape No. 33

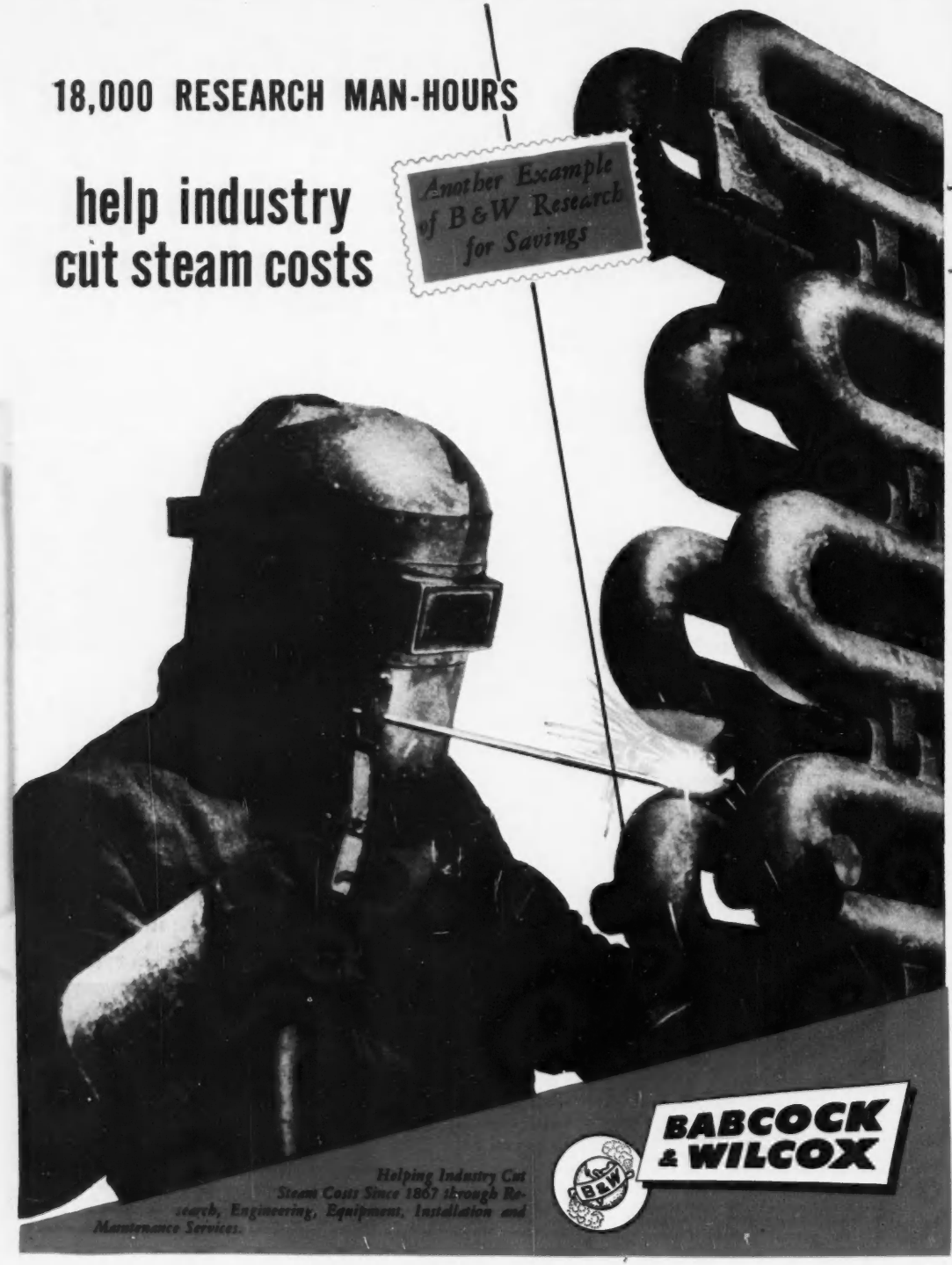
"JOB SIZE" ROLLS of "SCOTCH" No. 33 Electrical Tape are also available. Packed 12 in a screw-top container to keep out dust and dirt, prevent bruising of tape in tool drawers. Rolls are ¾ in. x 20 ft.

The term "SCOTCH" and the plaid design are registered trademarks for the more than 100 pressure-sensitive adhesive tapes made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives.
General Export: Minnesota Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y.
In Canada: Minnesota Mining & Mfg. of Canada, Ltd., London, Canada.

18,000 RESEARCH MAN-HOURS

help industry cut steam costs

Another Example of B&W Research for Savings

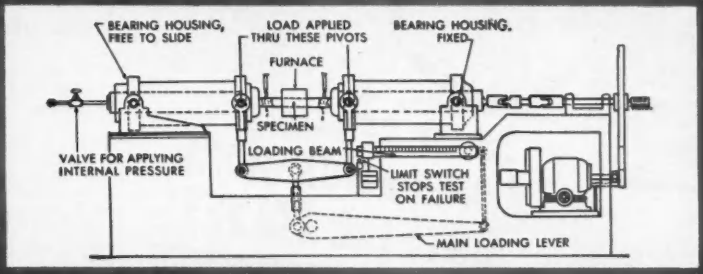


Helping Industry Cut Steam Costs Since 1867 through Research, Engineering, Equipment, Installation and Maintenance Services.

BABCOCK & WILCOX

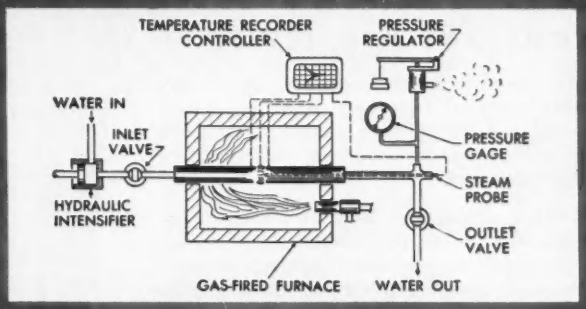
ROTATING BEAM FATIGUE MACHINE

Designed and built by B&W, this apparatus is used to observe fatigue of welded joints under simulated operating conditions: internal pressures to 4000 psi, temperatures to 1400 F, and variable stresses.



CYCLIC QUENCH APPARATUS

Also designed and built by B&W to test effects of repeated quenching on welded specimens at 1050 F and 2500 psi — i.e., actual boiler operating conditions of highest temperature-pressure combination now in service.



Steel—basic in industry—assumes many forms to meet the increasingly severe conditions of modern boiler operation. For example, B&W uses eight or more different steel analyses to obtain optimum dependability, service life, and economy for their high-pressure, high-temperature units.

These Steels—individually, and under conditions each must meet—are stable, tough, flexible, and strong. However, when welded together, they tend to become intractable . . . creep, flow, stretch, warp, harden, crack, and otherwise change at the welded joints to a dangerous and costly degree. B&W is constantly seeking improved methods of welding—to curb these capricious traits of modern alloys . . . and to *help industry keep power costs down.*

For Example: B&W is continuing a three-year-old project, involving some 18,000 research man-hours, on joining widely dissimilar alloys in tubular form. Findings have already produced new methods of control and new welding techniques that are measurably superior to any used before. They add much to the assurance of dependable B&W boiler service at temperatures to 1050 F and pressures as high as 2500 psi.

This Sort of Creative Research in problems of boiler design and construction is an 80-year-old story at B&W. Perhaps it's just what is needed to bring *your* current steam-generating problem to a profitable solution.

G-5137

TRUE VALVE ACTION ASSURES CONSTANT PROTECTION

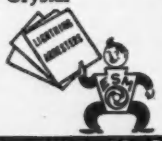
You get maximum, efficient protection for transformers and other electrical equipment when you install Crystal Valve Arresters. True valve action assures split second operation, preventing "black-out" of service to consumers.

Crystal Valves withstand the ravages of weather extremes, and are long lasting in service. All of the desired characteristics of ideal lightning arrester protection are incorporated. Oxidized Silicon Carbide grain found only in Crystal Valves provides an additional margin of protection.

- Low IR Voltage drop
- Ample surge discharge capacity
- Extremely marked valve action for follow current interruption
- No measurable deterioration
- Long service

Reduce your maintenance and operating costs, protect your power line equipment by installing Crystal Valve Arresters.

Write Dept. 1709 for latest technical data on lightning arresters and their installation. Ask for CV catalog.



ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

Valve Elements and Spark Gaps must be Coordinated

by

J. R. McFarlin, Vice President

ELECTRIC SERVICE MANUFACTURING CO.

In a previous talk about non-linear valve element of valve type arresters it was pointed out that their resistance will be high when subjected to low voltage or current and low when subjected to high voltage or current; these changes are cyclical—not permanent.

In another talk spark gap elements and assemblies were briefly discussed. A lightning arrester embodies generally a spark gap assembly in series with a valve element; its primary function is to protect insulation from high voltage; its secondary function is to interrupt system current that may follow a lightning discharge through the arrester to ground; the spark gap and valve element play important parts in these two functions and for highest arrester efficiency must be properly coordinated.

A lightning arrester will perform a cycle of operation if it has a spark gap assembly having a *very low* impulse sparkover voltage in series with a valve element having a *very high operating* resistance, but protection to insulation will suffer due to high voltage built up across the valve element; an arrester will also perform a cycle of operation with a multi-gap spark gap assembly having a *very high* impulse sparkover voltage in series with a valve element having a *very low* resistance; but again protection to insulation will suffer, this time due to high impulse sparkover of the gap assembly. In both of these cases it may be assumed that any flow of system follow current will be interrupted.

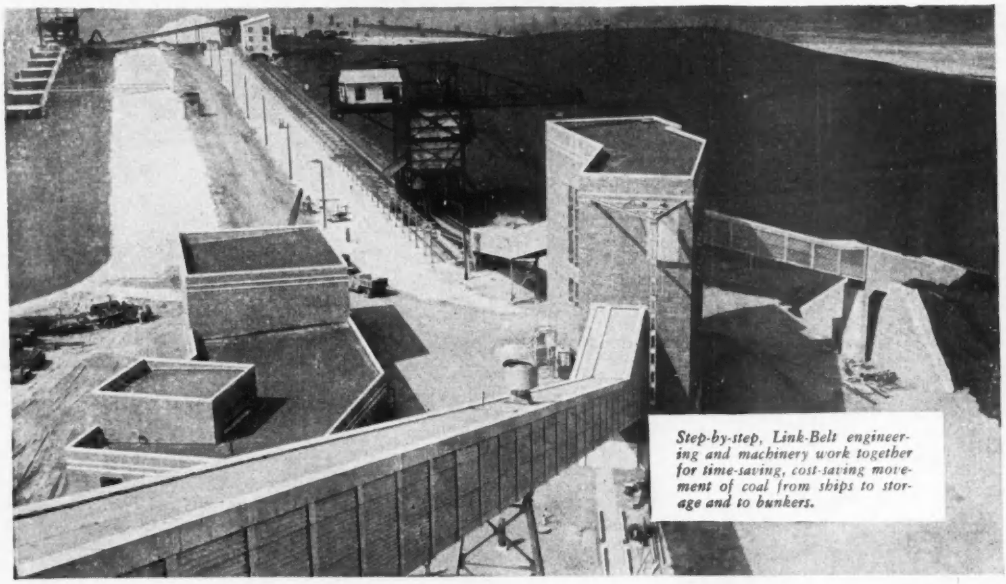
A lightning arrester consisting either of a spark gap structure alone or a valve element alone, or with extremes of either in combination with the other cannot be made to function properly and efficiently on modern circuits; both must be used, the one to assist the other in the proper performance of its two operating functions.

Knowing the requirements the designer must compromise between impulse sparkover voltage of the gap assembly and the current resistance characteristics of the valve element and secure a balanced structure which will efficiently protect insulation from the standpoint of impulse sparkover and IR voltage of the valve element, plus ability to satisfactorily interrupt system follow current flows. Proper coordination of these functions results in a good arrester; improper coordination in a poor arrester.

Due to the highly efficient spark gap assembly of the Crystal Valve Arrester and the oxidized silicon carbide valve element used only in this arrester, a most excellent degree of coordination between the two has been attained; this in addition to other factors is responsible for the world-wide recognition which these arresters have enjoyed for many years.

(*Advertisement*)

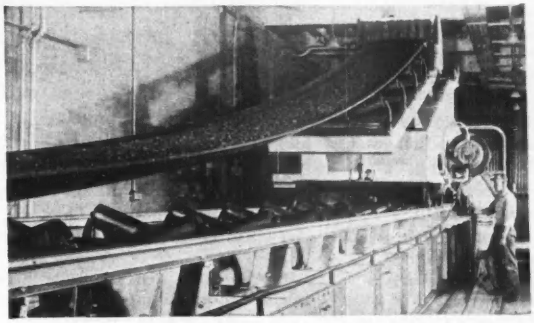
LINK-BELT engineering...



Step-by-step, Link-Belt engineering and machinery work together for time-saving, cost-saving movement of coal from ships to storage and to bunkers.

LINK-BELT equipment...

...combine to cut coal handling costs — from unloading to delivery to power plant bunkers



Link-Belt answers a vital need for the more efficient handling of coal in power plants—large and small. Here a Link-Belt Belt Conveyor and motor-operated traveling tripper distribute coal to bunkers through a dust-tight bin seal.

YOU name your coal handling problem—look to Link-Belt for the answer! Based on experience gained in hundreds of installations in power plants everywhere—Link-Belt has the facilities, the proven equipment, the engineering know-how to carry the ball from start of operations planning to delivery of coal. Regardless of the size of your plant—Link-Belt engineers can recommend exactly what you need for more efficient coal handling.

Conveyors, elevators, feeders, car dumpers and shakers, screens, hoists, hoppers, chutes, gates, stackers, unloading towers, weigh larries and related power plant equipment and accessories—all can be supplied by Link-Belt—*the most complete line* in the field.

So for simpler, more efficient, increased capacity coal handling methods—lower operating and maintenance costs—call on Link-Belt.

Our engineers will cooperate with you or your consultants to find the most economical solution for your problems. Write for details.

12,204

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities.

LINK-BELT
COAL HANDLING EQUIPMENT

It takes journalism-

to make

HOW ELECTRICAL WORLD's MAKES THE WHOLE GREAT TO ITS EDITING

Magazines aren't born great. It takes years . . . more than that, it takes pioneering and outstanding service to an industry to develop the kind of influence that makes ELECTRICAL WORLD an energetic and continuing force in the "great growth" electric power industry, today.

Here, for example, are some of the outstanding editorial jobs in ELECTRICAL WORLD's 77 years of *active* journalism. They are some of the reasons why advertising in its pages has such great impact.

1. The once-a-year STATISTICAL AND FORECAST Issue. Started in 1904, it was the industry's *only* statistical sourcebook for 20 years. Today, it is the industry's accepted guidepost to the year ahead. This alone makes ELECTRICAL WORLD the basic authority in its field.

2. Continuing a philosophy toward system planning by utilities which was started by a famous article in 1929, Electrical World is now planning broader, more timely and useful articles on the system. Since 1929—for 20 years—Electrical World has hammered home system planning so consistently and skillfully it's now an accepted concept.

3. "THE ELECTRIC POWER INDUSTRY — Past, Present and Future" was an entire issue of ELECTRICAL WORLD in 1949. It has since been published as a book. It was the first comprehensive study of the development of modern electric systems and apparatus . . .

4. "BLUEPRINTING THE FUTURE," analysed the political, economic and technical trends of the industry from 1950 to 1965. It's widely acclaimed . . . widely circulated . . . widely used in scheduling expanded production. It was followed in 1951 by "Mobilization Today and in the Next 4 Years," a measurement of the industry's place in today's economy.

The list could go on . . . and on. It could show the periodic STEAM STATION COST SURVEYS that help solve the major problem of generating a kilowatt at lower cost. Or the important articles on buried cable, the Safety Issue, the widely-used "Cost-cutting" issue in 1949, the roundup of 1950 storm data, with 13 major emergency problems of storm damage documented, the yearly Forecast Issue that expertly measures the coming year . . .

But the point is clear. ELECTRICAL WORLD is edited *creatively* . . . from close knowledge of the industry and its needs . . . to provide the month-to-month program of outstanding service that not only helps the industry to grow, but gets down to the basic, brass-tacks handling of its major problems.

When readers look to a single magazine for such *active* leadership, naturally they read its advertising, too, with more *active* interest.

GOOD ADVERTISING PAYS IN

Electrical World

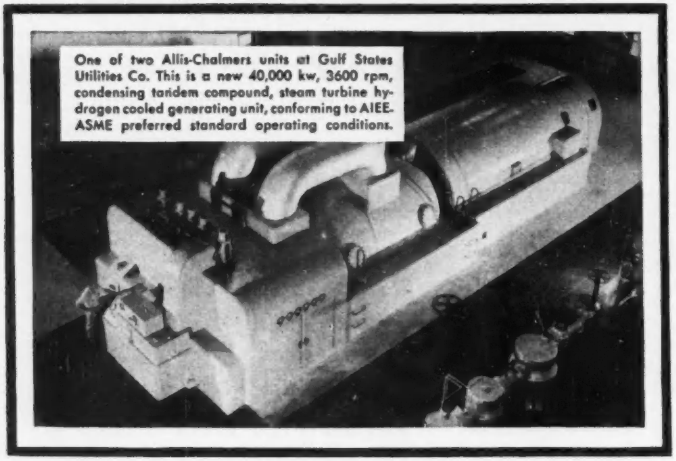
JOURNAL OF THE GREAT GROWTH INDUSTRY FOR 77 YEARS

A McGRAW-HILL MAGAZINE
McGRAW-HILL BUILDING, NEW YORK 18

ABC • ABP

Booming South's Power Needs Met by

STEAM TURBINE GENERATORS!



One of two Allis-Chalmers units at Gulf States Utilities Co. This is a new 40,000 kw, 3600 rpm, condensing tandem compound, steam turbine hydrogen cooled generating unit, conforming to AIEE-ASME preferred standard operating conditions.

BOOM COUNTRY DEMANDS POWER and Allis-Chalmers turbine generator units in the Riverside Station of the Gulf States Utilities Company help service the mushrooming industrial and agricultural empire in southwest Louisiana.

More than 662,000 people live in the area served exclusively by Gulf States, ranging from Baton Rouge to across the Brazos river in Texas. In the last decade its customers have more than doubled and power consumption has more than tripled.

A 75,000 kw station, near the port city of Lake Charles, Louisiana, is the central generating station of the Gulf States system.

In 1947 an Allis-Chalmers 35,000 kw steam turbine generator unit was installed. This was followed by a larger 40,000 kw unit in 1950.

Helpful Information Available

When you plan the installation or expansion of a steam-electric power plant, let Allis-Chalmers simplify your problem. This *one* source will provide you with a *complete* range of quality power plant equipment. Bulletin 03B6801A on standardized steam turbine units and literature on all products listed below are now available to help you make your selection.

Call your nearest A-C representative or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3493

ALLIS-CHALMERS

TURBINES & GENERATORS | CONDENSERS & PUMPS | SWITCHGEAR & BREAKERS | MOTORS & CONTROL | TRANSFORMERS | WATER CONDITIONING

World's Widest Range of Power Plant Equipment

Approved by UNDERWRITERS LABORATORIES

YES, the PENN-UNION Connector TAKES THEM ALL-

LARGER SURFACES for the WRENCHES ~ a good-sized HEX Top and Bottom

The men who use connectors appreciate the *better design* of the Penn-Union - - especially when they have to make a splice in close quarters, or any unhandy location.

Better Design is a feature of the entire Penn-Union line, which includes Tees and Taps, Straight Connectors, Terminals, Grounding Clamps, and many more fittings . . . every one thoroughly dependable, mechanically and electrically. *Preferred by leading users,* who have found that "Penn-Union" on a fitting is their best guarantee of unfailing service.

Far More in use than any other

Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

Canada: Dominion Cutout Company, Ltd., 250 Richmond St. West, Toronto

The Complete Line of Conductor Fittings

PENN-UNION

ONLY TIREX
HAS THE
SELENIUM
NEOPRENE ARMOR

Only Simplex-TIREX cords and cables are jacketed with the famous Selenium Neoprene Armor. This famous cured-in-lead jacket is well known wherever tough, hard jobs are found. Whether it is coal mining, ship building, open pit mining operations, rock quarrying or foundry work the tough, cured-in-lead jacket provides the kind of staying power that you want. Wherever rough, abrasive conditions are found, there you will find the jobs that TIREX excels at doing.

Actual service records show that Simplex-TIREX cords and cables have proved to be the most economical because the Selenium Neoprene Armor lasts so long.

Whenever your requirements call for the use of a portable cord or cable, specify and be sure that you get Simplex-TIREX Cords and Cables.

If it isn't made by Simplex it isn't Tirex

Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.,

GUARANTEE

QUALITY ELECTRIC-AL

TAPES

BLUEPRINT FOR KNOW-HOW!

ACCURATE
FRICTION TAPES

Quality made of highest grade rubber and finest cotton base. Affords maximum mechanical protection. Available in Standard and A.S.T.M.-Specification grades.

ACCURATE
RUBBER TAPES

Offers high elasticity, excellent cohesion, high dielectric strength and super aging qualities; made in both Standard and A.S.T.M.-A.A.R. grades.

ACCURATE
PLASTIC TAPE

Thin caliper reduces bulk in tight spots. Strong mechanically and offers high dielectric strength. Recommended for use wherever plastic tape is practical.

TAPE TIPS:
FOR ELECTRICAL MEN

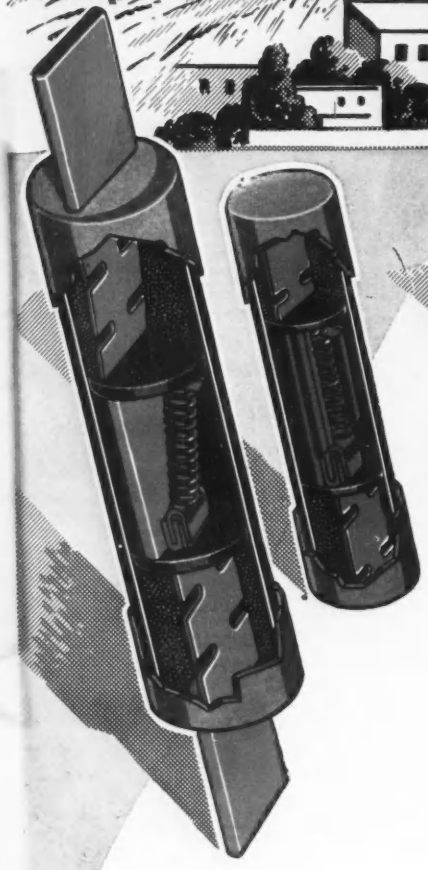
Using rubber tape that coheres without heat or extra pressure, makes taping jobs easier, quicker. That's ACCURATE, and super aging means your "wraps" improve with age. Remember — friction or rubber, ACCURATE Tapes make *accurate* wraps!

ACCURATE YOUR BEST BUY IN TAPE

MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

"The cost of changing to FUSETRON dual-element FUSES has been paid for more than ten times over in sustained production time"

. . . says *Mr. John H. Van Houten,*
Superintendent
Paul Lime Plant, Paul Spur, Arizona



HERE'S HOW

"Prior to February, 1948 we used ordinary renewable fuses throughout our plant. They gave us short-circuit protection but we lost a great many motors due to single phasing, excessive heating and climatic conditions.

"When a motor goes out in a plant like ours, it costs us a loss in production that is difficult to make up.

"In February, 1948 we changed the whole plant over to Fusetron fuses. On the motors we installed a size to give motor running protection.

"We have completely eliminated motor losses due to single phasing and believe we have better all-around protection than before.

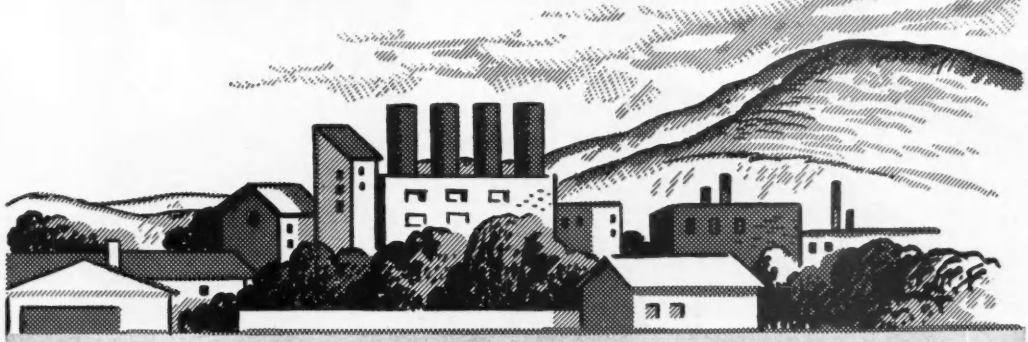
"Our records show that the cost of changing to Fusetron fuses has been paid for more than ten times over in sustained production time.

"What more could we ask?"

John H. Van Houten

(Fusetron is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

You Too, Can Cut Production Losses and Save Many Times Their Cost by Changing to FUSETRON dual-element FUSES



HERE'S WHY

FUSETRON dual-element FUSES GIVE 10 POINT PROTECTION

1. ★Protect against short-circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

★Fusetron fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

DON'T RISK LOSSES!

One **lost** motor . . .
One **needless** shutdown . . .
One **destroyed** switch or panel
One **burned out** solenoid . . .

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

USE THE COUPON

Bussmann Mfg. Co.,
University at Jefferson,
St. Louis 7, Mo.
(Division of McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

Name.....
Company.....
Address.....
City & Zone..... State.....

1251

We Gain TWO WAYS

with Westinghouse Induction Regulators

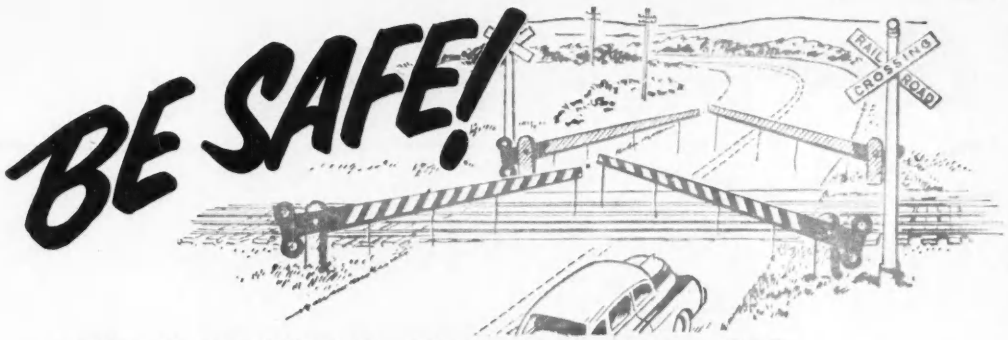
Westinghouse Induction Regulators installed at urban substations give double duty. They're dollar *makers* and dollar *savers*. They assure maximum revenue by faithfully delivering adequate and sustained voltage. They cut regulating costs because Westinghouse design provides sure operation with minimum maintenance.

New electrical controls simplify adjustments over the complete range of balance voltages and band widths. Dependable settings are simply a matter of turning dials . . . as easy as tuning in a radio. The voltage level setting is accurately calibrated, permitting adjustment without disturbing the line-drop compensator. Either may be adjusted without interrupting the operation of the regulator.

Sturdy regulator construction assures long, trouble-free life. All relay moving elements are mounted on stainless steel spring hinges. Thus, maintenance inherent with bearings is eliminated. Metallic contact of the pole faces on the motor-operating relay has been entirely eliminated by use of the spring-supported, snap-action element, making it impossible for the relay to stick because of residual magnetism.

Westinghouse Induction Regulators are available in three types, to meet all urban station requirements . . . your choice of oil-cooled, air-cooled or inerteen-cooled construction. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-10371

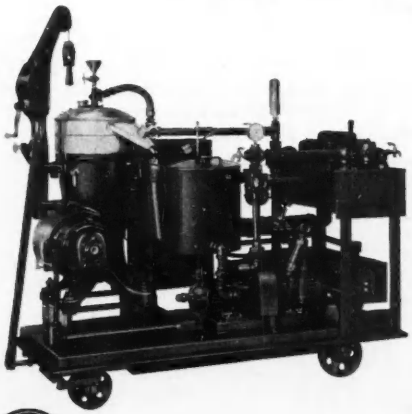
YOU CAN BE SURE...IF IT'S
Westinghouse
VOLTAGE REGULATORS



PURIFY YOUR INSULATING OIL THE DE LAVAL CENTRIFUGAL WAY

De Laval Insulating Oil Purifiers provide the means of maintaining a high dielectric that is safer . . . more reliable . . . and more economical. In the bowl of the De Laval Oil Purifier water is ***continuously*** removed by means of centrifugal force.

In a De Laval machine, water immediately discharges to waste, and never collects in the bowl. The Purifier always operates at constant high efficiency . . . never suddenly loses its effectiveness. Thus there is no danger that a batch of oil in the process of purification will go in an instant from a high to a low dielectric test.



De Laval Insulating Oil Purification has other advantages, including low operating cost, low temperature purification and high daily capacity.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

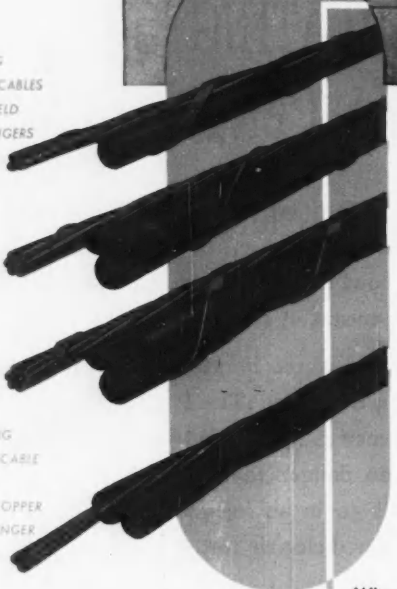
INSULATING OIL PURIFIERS

SPECIFY

Copperweld TRADE MARK

NEUTRAL-MESSENGERS

for your self-supporting cables



SELF-SUPPORTING AERIAL POWER CABLES WITH COPPERWELD NEUTRAL-MESSENGERS

SELF-SUPPORTING SERVICE DROP CABLE WITH TYPE BC COPPERWELD COPPER NEUTRAL-MESSENGER

They'll give you:

LOWER COSTS
INITIALLY AND IN THE LONG RUN

GREATER SAFETY
FOR LONG SPANS WITHOUT EXCESSIVE SAGS

ADDED STRENGTH
TO WITHSTAND HEAVY ICE AND WIND LOADS

LONGER LIFE
BECAUSE THEIR STRENGTH IS PERMANENT

HIGH CONDUCTIVITY
FOR RETURN CURRENT IN NEUTRAL

PROTECTION AGAINST RUST
A COMPLETELY NON-RUSTING COMBINATION

NEAT APPEARANCE
COMPACT, SNUGLY STRANDED CABLE

When ordering Self-Supporting Cables from your regular suppliers, get all these important advantages by specifying Copperweld* for the Neutral-Messenger. Experienced Engineers are following this practice. They know that Copperweld combines the high strength of steel with the permanence and conductivity of copper.

*Trade Mark

COPPERWELD NEUTRAL MESSENGERS ARE MADE IN SIZES AND TYPES TO MEET VARIOUS COMBINATIONS OF MECHANICAL STRENGTH AND CONDUCTANCE

COPPERWELD STEEL COMPANY Glassport, Pa.

SALES OFFICES IN PRINCIPAL CITIES

Copperweld TRADE MARK NON-RUSTING

NEUTRAL-MESSENGERS

FOR SELF-SUPPORTING CABLES

there's a long-standing connection between

ALUMINUM

and

BURNDY

XVSU

YPG-2

RSU

Increasing use of aluminum conductor distribution systems has naturally raised many questions concerning connections . . . connections for aluminum to copper and aluminum to aluminum . . . cold flow . . . oxidation . . . corrosion . . . questions that Burndy is prepared to answer for you immediately.

With a 10-year background of aluminum research, development and field testing, Burndy engineers are ready with the right answers and the right connectors to meet all your application requirements.

For quick practical help in solving your aluminum problems, contact Burndy. Remember: connectors for aluminum are no problem to Burndy.

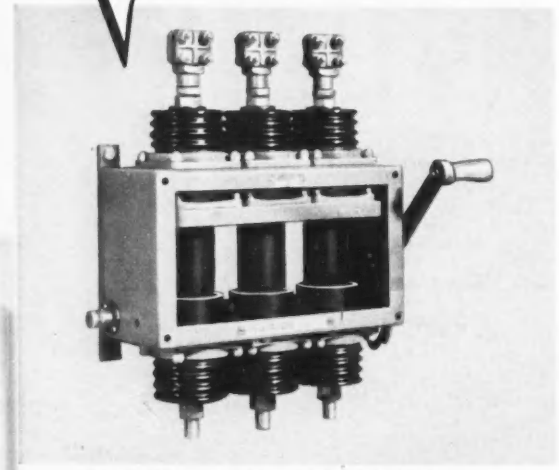
BURNDY

BURNDY ENGINEERING COMPANY

New York 54, N. Y. • Venice 55, California

Burndy Canada Ltd., Toronto 9, Ont.

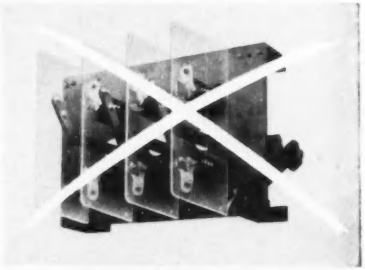
DISCONNECT HIGH-VOLTAGE APPARATUS THE MODERN WAY



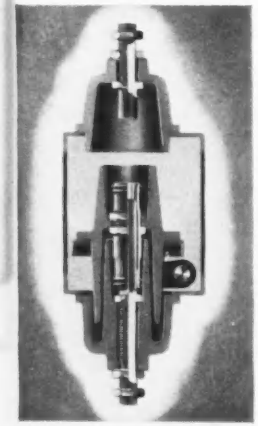
3.P.S.T. 600 ampere 7500 volt ISOLATOR with clamp type terminals on upper studs.

Loads can still be hauled by a horse and wagon, but it's rarely done anymore.

Likewise high voltage apparatus can still be disconnected using blade type disconnects, but the Three E ISOLATOR provides a better way.



3.P.S.T. 600 ampere 7500 volt blade type disconnect.



Cross sectional view of 400 ampere 5000 volt ISOLATOR in open position.

ISOLATORS *save in these ways.*

1 SPACE

Opened or closed, the ISOLATOR occupies only the space normally allotted for passage of conductors. This is about one half the space required for a similarly rated blade type disconnect.

2 MATERIALS

Insulating barriers, steel for enclosures, bus supports, and jumper connections can be saved by using ISOLATORS.

3 ACCIDENTS

Current paths of the ISOLATOR are enclosed in insulation and terminal connections arranged for easy taping, therefore accidental contact is not possible. Blades and clips of conventional disconnects always present a hazard.

You Can Do It Better With An ISOLATOR

ISOLATORS are built for ampere ratings to 2000 and for voltage ratings to 15000.

Ask for bulletin 140. It gives the complete ISOLATOR story.

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

Amcreco CREOSOTED poles

POLES • PLANKING
CROSSARMS
CONDUIT

The high initial strength of Amcreco Creosoted poles remains practically constant throughout the long life of the pole.

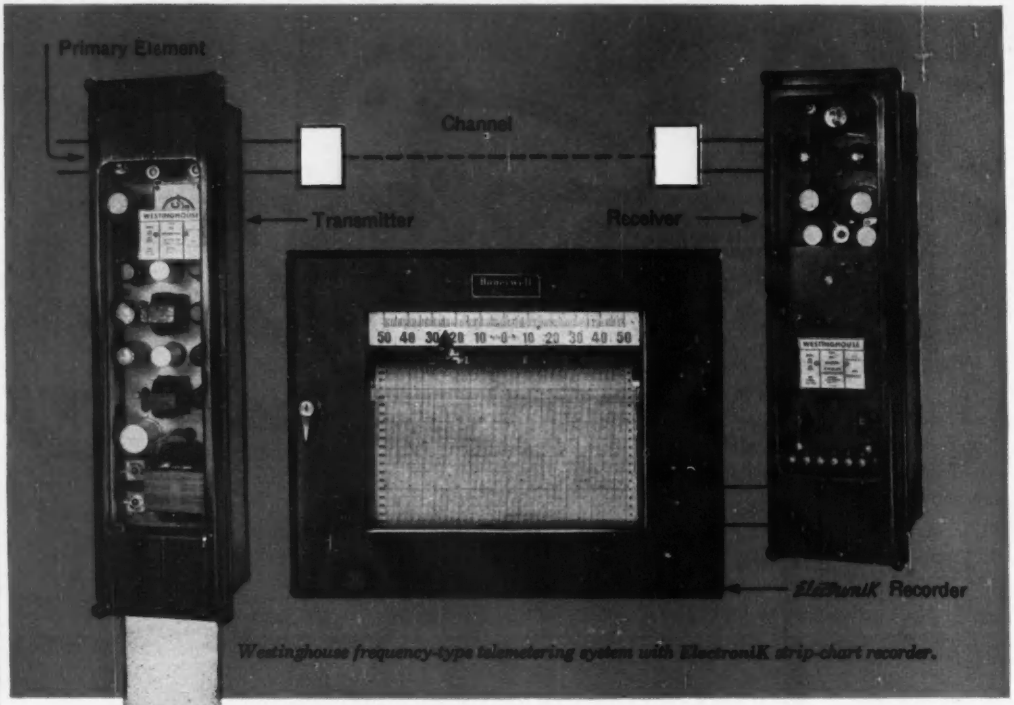
AMERICAN CREOSOTING COMPANY
INCORPORATED

COLONIAL CREOSOTING COMPANY
INCORPORATED

AMCRECO

GEORGIA CREOSOTING COMPANY
INCORPORATED

ADDRESS INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.



Westinghouse frequency-type telemetering system with ElectroniK strip-chart recorder.

ElectroniK RECORDER

now combined with

ADVANCED TELEMETERING SYSTEM

IN this system, an *ElectroniK* recorder assures rapid and accurate collection of all vital information at a central location in a matter of seconds. Non-cyclic, non-periodic, continuous telemetering action of the system is matched by the continuous balance of the *ElectroniK* recorder. As a result, *both* telemetering and recording are *continuous*, with no periodic electro-mechanical relaying or feeling motion in the accessory equipment.

The system comprises an arrangement capable of measuring, transmitting, receiving and recording any measurable variable that can be converted into an electrical quantity. It keeps the load dispatcher in constant touch with each station . . . helps him determine when to pick up or drop blocks of power, how well the outlying stations are maintaining their loads, and to keep up-to-date on the relation of his area to adjacent areas.

Details of this system, with drawings of single and multiple station telemetering, equipment required, etc., are all contained in Data Sheet No. 9.1-9. Write for your copy today.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
Brown Instruments

Exclusive Techniques Assure Top Performance In Elkonite Contact Materials*

ELKONITE CONTACTS

Elkonite contacts are made by the only method which permits the combining of the desirable features of basic metals which cannot be alloyed. By this means, the high melting points of tungsten, molybdenum, or their carbides, can be combined with the current-carrying ability of silver or copper.

Elkonite materials are best known for their hardness, resistance to mechanical wear and impact, resistance to erosion by arcing, and resistance to sticking.

*Reg. U. S. Pat. Off.

**The ability of a contact material to withstand the erosion of an electric arc.

The secret of Elkonite superiority is the technique by which this composite material is made to retain such a high degree of the desirable properties of each of the constituent metals. Mallory engineers have so developed this art that no other contact material has equalled Elkonite in all four features that spell top performance every time . . . conductivity, impact strength, AR** factor, and heat resistance.

Thus, Elkonite . . . the result of precision compounding to take the best advantage of specific properties . . . can deliver an extra measure of satisfaction in service.

That's result beyond specification!

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

Electrical Contacts and Contact Assemblies

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

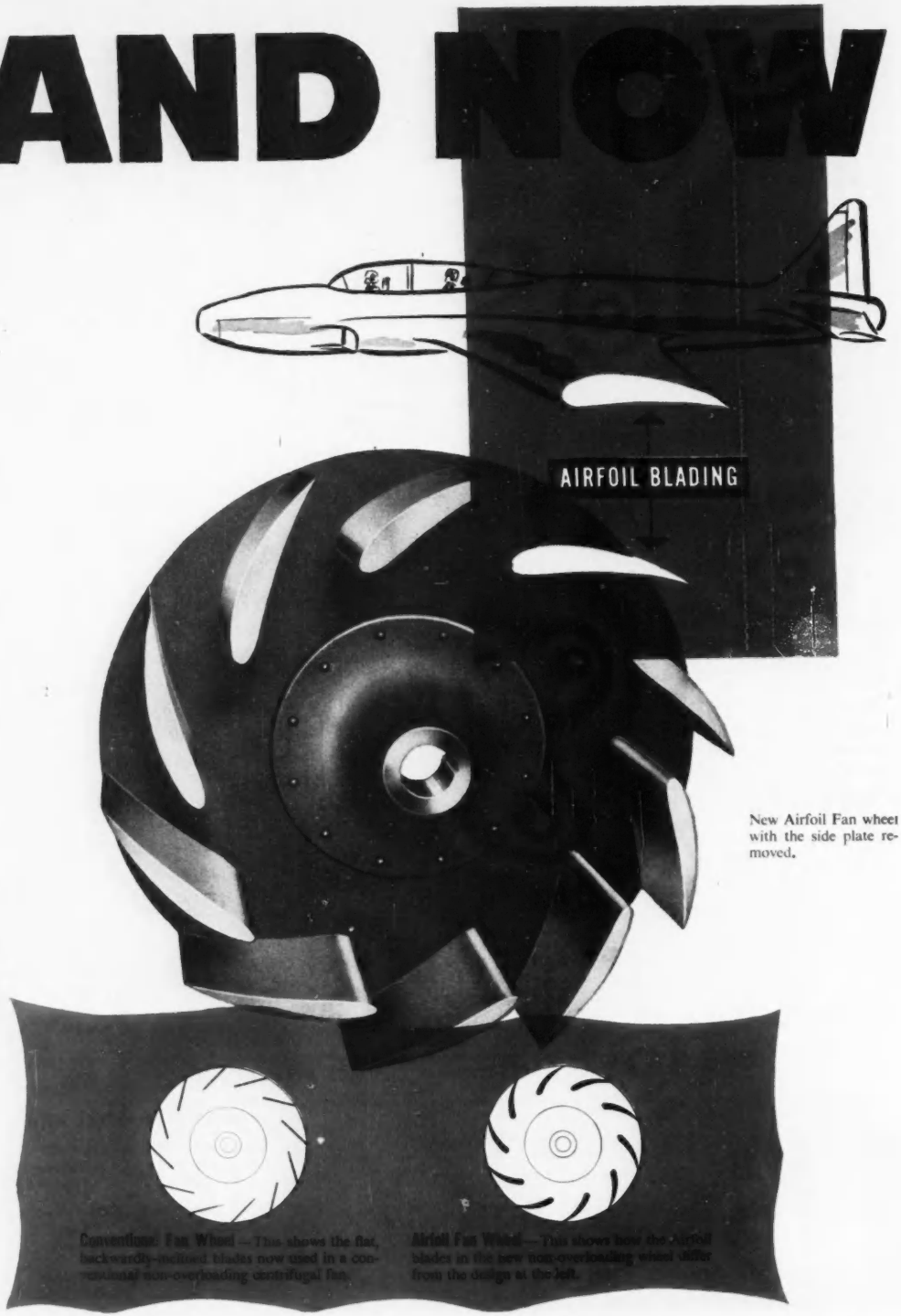
SERVING INDUSTRY WITH

Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

Metallurgical Products
Contacts *Special Metals*
Welding Materials

AND NOW



New Airfoil Fan wheel with the side plate removed.

Conventional Fan Wheel—This shows the flat, backwardly-inclined blades now used in a conventional non-overloading centrifugal fan.

Airfoil Fan Wheel—This shows how the Airfoil blades in the new non-overloading wheel differ from the design at the left.

A CENTRIFUGAL FAN WITH AIRFOIL BLADING

Sturtevant Pioneers Again

Here's another major advance in fan design by Sturtevant —the new Airfoil Non-Overloading Centrifugal Fan.

In 1914, Sturtevant made high efficiency possible with the non-overloading centrifugal fan—the TURBOVANE®. Then, in 1930, low-cost Sturtevant VANE CONTROL® increased the efficiency of part-load operation. Now, in 1951, the new Sturtevant Airfoil blade achieves new heights in peak efficiency with "the wings of an airplane" housed in a centrifugal fan.

Higher Efficiency and Quieter Operation

Sturtevant's scientific application of Airfoil Blading produces a new high in efficiency and a new low in noise level:

Efficiency . . .	**90% plus**
Noise Level . .	**65% less**

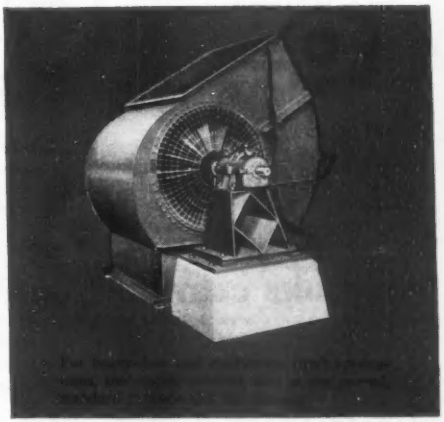
Wherever operating cost means more than first cost—where evaluation and a reasonable price mean more than a low price—the Sturtevant Airfoil, Non-Overloading Fan is the answer.

Recent Purchasers

Airfoil Fans were selected by the Consolidated Edison Company of New York for their Astoria and East River Plants, and have been *successfully witness tested.* Other orders have been received from Duke Power Co., New York Gas & Electric Co., Pennsylvania Electric Co., Tennessee Valley Authority, and also for ventilation of the new Squirrel Hill Tunnel in Pittsburgh.

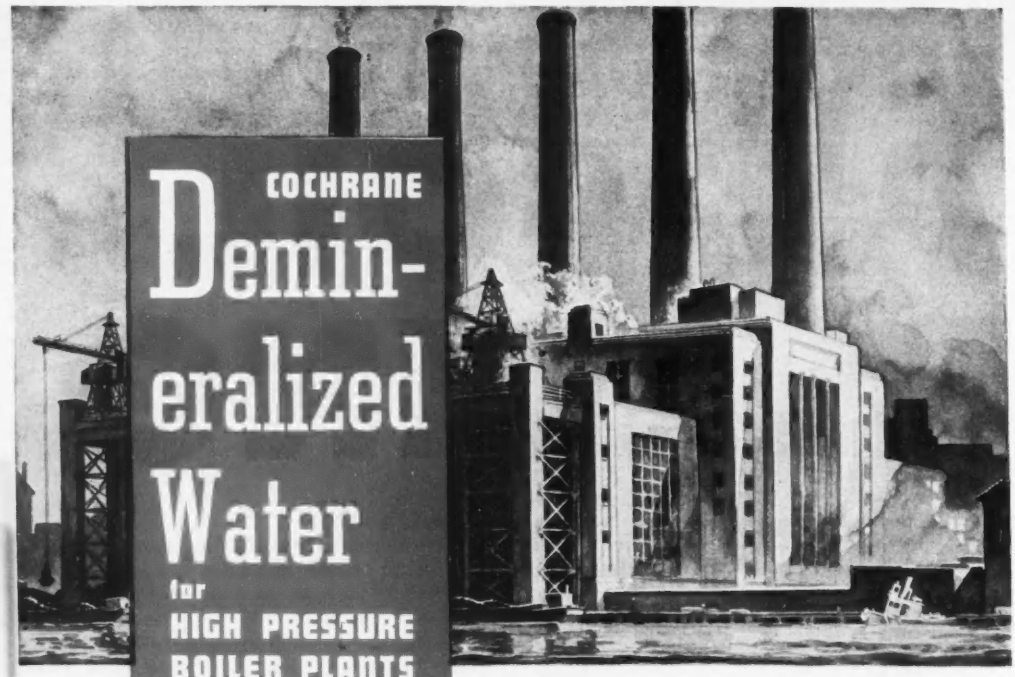
Where To Use

If low operating cost is of primary importance to you in your air handling applications, as it is in mechanical draft for utility and industrial power plants, in high-velocity air conditioning systems, and for vehicular tunnel ventilation, this new fan is available to you. For full information, contact your local Westinghouse-Sturtevant office, or write to Westinghouse Electric Corporation, Sturtevant Division, 166 Damon St., Hyde Park, Boston 36, Massachusetts.



YOU CAN BE SURE...IF IT'S Westinghouse

J-80244



DEMINERALIZED boiler make-up water as an alternative to water supplied by evaporators has become a topic of great interest to boiler plant operators everywhere. Comparisons of costs, both original equipment and operating costs, have shown exceptional savings by demineralizing.

Some advantages that have been shown include:

1. **Demineralizers insure constant adequate makeup supply,** as they always operate at rated capacities. Evaporator output varies with the turbine load, consequently rated output is not maintained at low loads.
2. **Gains in turbine-cycle efficiency** more than offset the cost of chemicals used in demineralizing.
3. **Demineralized water is more uniform** and practically free from corrosive CO_2.
4. **Lower maintenance costs.** Corrosion due to CO_2 produced by evaporators is responsible for maintenance not necessary where demineralized water is used.
5. **Lower labor costs.** Demineralizing plant can be made automatic.

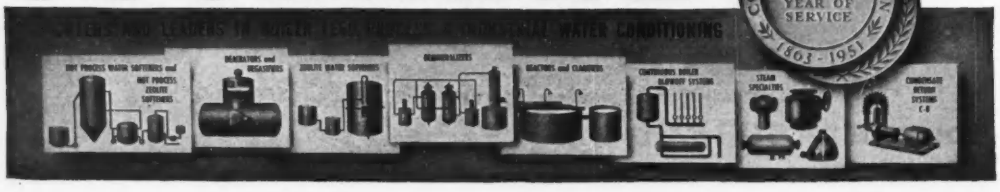
While the problem of corrosion can often be licked by pretreating the water with hydrogen zeolite or by demineralizing ahead of the evaporators, many plants are finding that demineralizing including anion silica removal without evaporators is more satisfactory and in addition more economical.

Cochrane has some comparison figures on the subject and will be glad to send them to interested executives.

COCHRANE CORPORATION • 3146 N. 17th St. • Philadelphia 32, Pa.

In Canada: Canadian General Electric Co., Ltd., Toronto • In Mexico: Babcock & Wilcox de Mexico, S. A., Mexico City • In Europe: Recuperation Thermique & Epuration, Paris

COCHRANE



Proof of Performance

demand it in your wood preservative, too

For more than a century Creosote Oil has been undergoing the most conclusive service tests devised—actual use in literally millions of applications of treated wood.

And for nearly 70 years results of its use have been carefully recorded. These service records—many of them compiled long before other preservatives were even thought of—are your only safe guide in choosing your wood preservative. Creosote Oil gives you proof, not promises.

U·S·S Creosote Oil is undergoing a wide variety of service tests under the most adverse conditions . . . is proving again and again it has the toxicity and permanence to keep replacements at an absolute minimum.

For immediate delivery by tank car or barge from our plant at Clairton, Pa., contact our nearest sales office or write directly to United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pa.

USS

U·S·S CREOSOTE OIL

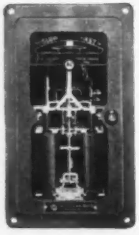
UNITED STATES STEEL

ALLIS-CHALMERS POWER PLANT CONTROLS

7 Keys

1 SYNCHRONIZING MACHINES

Automatic synchronization of generators, synchronous condensers and tie lines, no matter how large, is the job done smoothly, quickly and unerringly by the *Synchro-Operator.* Just turn a control switch and it takes over — indicates relative speed and phase angle . . . anticipates time for circuit breakers to close.



The *Synchro-Operator* is absolutely safe and eliminates the danger of manual synchronizing errors. It automatically brings the incoming machine into step with the line and closes the generator breaker at exact synchronism. With the *Synchro-Operator,* it's possible to synchronize from a remote point.

2 ORDER TELEGRAPH SYSTEMS

The Allis-Chalmers Order Telegraph System is accurate and reliable. Sending and receiving orders is accomplished on one dial — saves valuable switchboard space — aids operating personnel. Receipt of each message is assured by an alarm system which operates until the order is returned correctly.

The many uses of Allis-Chalmers dc Positioning Devices include control and indication of remote valves in hydro plants, transmission of orders between switchboard and turbine room, gate position indication and control, water level indication, and hydraulic turbine governor control. Select either a five or ten-inch semiflush dial.

5 ROCKING CONTACT VOLTAGE REGULATORS

Rocking Contact Voltage Regulators have established long records of dependability. "Not one dollar spent for maintenance in fifteen years of continuous service," is typical experience.

Designed for panel mounting, this regulator makes a neat installation on any switchboard. Regulation is achieved by rocking a carbon-rimmed sector over a silver-plated stationary commutator to control the amount of resistance in the exciter shunt field.

When selecting generator voltage regulators, remember that Allis-Chalmers builds both mechanical and rotating types . . . makes recommendations based on your requirements.

6 STARTING AUXILIARY MOTORS

There is an Allis-Chalmers starter for every motor need . . . full or reduced voltage; for synchronous, wound-rotor or squirrel-cage motors.

Choose Type H Starters for 2300-5000 volt motors. They are engineered to your application — offer complete protection to personnel and equipment through compartmented cubicles, current limiting fuses, overload, undervoltage, interlocking and other devices.

For 110-550 volt motors, sizes 0 to 7 starters cover the range from fractional to 600 hp. Select from a variety of enclosures and operating arrangements to fit your needs.

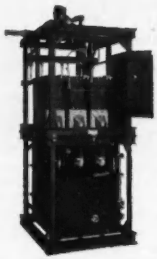
Synchro-Operator, Regulex and Rocking Contact are Allis-Chalmers trademarks.

ALLIS-CHALMERS

to Dependable Power

3 BOILER DRAFT FAN SPEED CONTROL

Draft fans operate at exactly the speed your boilers require for perfect combustion when Allis-Chalmers Type 257 Liquid Rheostats are used with wound-rotor drive motors. The right draft for any combustion condition is provided automatically by the wide range stepless speed control.

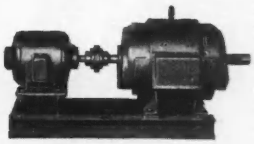


They have few moving parts, no arcing contacts, no mechanical connections to either fan or motor. Not only is the Allis-Chalmers Liquid Rheostat compact in size, but it can be placed in any convenient location — doesn't have to be adjacent to the motor it controls.

4 *REGULEX* VOLTAGE REGULATORS

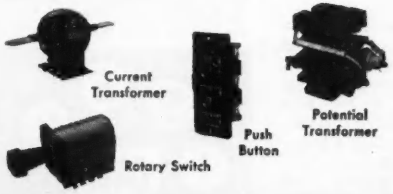
The *Regulex* Voltage Regulator is the most modern method of controlling voltage on large generators. *Regulex* Control eliminates the pilot exciter . . . has no vibrating or moving contacts.

High amplification and fast response of the *Regulex* Generator Voltage Regulator on system disturbances causes the generator field current to reach the required value for stability at the new load rapidly—thereby decreasing the possibility of the generator pulling out of synchronism . . . improving system stability and giving better regulation under all system conditions.



7 CONTROL BOARD AND SWITCHGEAR DEVICES

Allis-Chalmers switchgear devices include rotary control switches, pushbutton stations, current and potential transformers, disconnecting switches, indicating lamps, terminal boards, thermal relays, oil and air contactors, oil and air circuit breakers. All are designed and built to the high standards of reliability associated with the name Allis-Chalmers in power plant equipment.



SEND FOR MORE INFORMATION

These seven key power plant control devices are described more fully in bulletins and leaflets. Check off those you'd like to have on the coupon below and give it to your A-C representative, or send it to Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS Milwaukee 1, Wisconsin

Send me the leaflets and bulletins checked below:

- ☐ *Synchro-Operator* 14S6386B
- ☐ dc Positioner 14B6641
- ☐ Liquid Rheostat 1457544
- ☐ *Regulex* Voltage Regulator
  Rocking Contact Regulator
  - ☐ for small machines 14B6035
  - ☐ for larger units 14B6015
  - ☐ for dc generators 14B6137
- Starters
  - ☐ Type H 14B6410
  - ☐ Sizes 0 to 7 ..... 14B7132
- ☐ Switchgear and Control Devices 2587095
- ☐ Type 256 Air Contactor 1487303

Name _____ Title _____

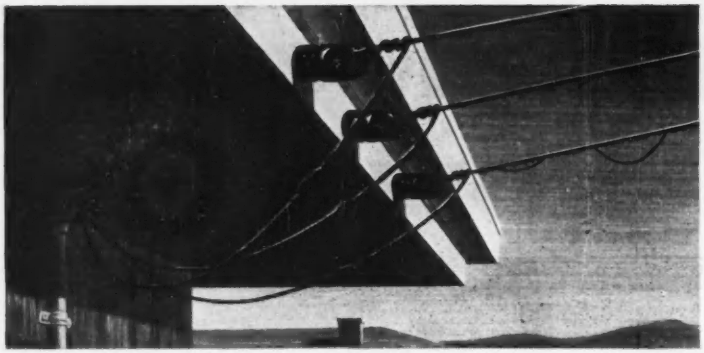
Company _____

Address _____

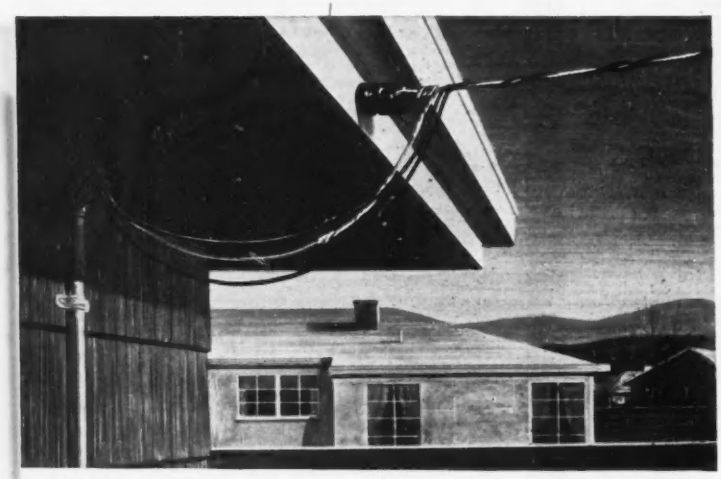
City _____ State _____ A-3500

A-C ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization



WHY THREE?...



WHEN ONE IS BETTER!

Kaiser Aluminum triplex service drop cable combines *three* wires in a single cable. Thus you get all these advantages:

Cost savings—compared with copper weatherproof installations—of *20 to 40 per cent!* The reasons: Triplex needs fewer accessories—requires only one house knob. Permits longer spans—cuts maintenance—because light weight and low wind and ice loadings reduce tension on house and pole. And it's installed easier, faster.

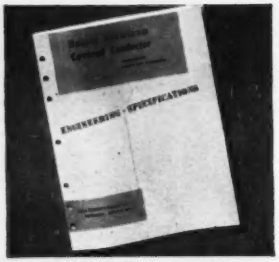
What's more, the single cable gives greater clearances, reduces contacts with trees, results in a far neater appearance.

Call us today for the facts! Sales offices in principal cities. Kaiser Aluminum & Chemical Sales, Inc., Oakland, California.

Also distributed by: General Electric Supply Corporation, Line Material Company, Mine & Smelter Company, Tafel Electric and Supply Company, Westinghouse Electric Supply Company.

Kaiser Aluminum

Setting the pace . . . through quality and service



FREE BOOKLET—Gives complete engineering data on the new Kaiser Aluminum Conductor. Includes both weatherproof and self-supporting conductor. Send for it today!

THREE-IN-ONE—Triplex is a single cable made up of three wires—two neoprene or polyethylene covered wires cabled about the bare neutral messenger. Coverings are light, free-stripping, clean to handle.

FOR SECONDARY LINES—In many cities Kaiser Aluminum triplex cable is now being installed in secondary lines. Aluminum duplex cable is being used on street lighting circuits.

TECHNICAL ASSISTANCE—Service engineers with years of experience in the conductor field will gladly provide technical assistance. Call any Kaiser Aluminum office. See your Classified Telephone Directory.

SHOWS YOU HOW TO SELECT PROPER CHARGING EQUIPMENT FOR

MAXIMUM STATIONARY BATTERY SERVICE

With properly selected charging equipment correctly set to meet emergency, control or float requirements, stationary batteries require almost no attention. However, proper selection and adjustment are vital factors. That's why the GOULD PLUS-PERFORMANCE PLAN includes information on charging equipment selection and adjustment in its library of technical material that is yours for the asking.

This timely plan includes articles, manuals, bulletins, specifications, record cards, charts and graphs illustrating and explaining how to select, charge, handle, maintain and determine the condition of your batteries. Use it and you can greatly extend the useful life of your battery installations. Send today for free booklet on the GOULD PLUS-PERFORMANCE PLAN.

Gould Planté—
The Aristocrat of
Stationary Batteries

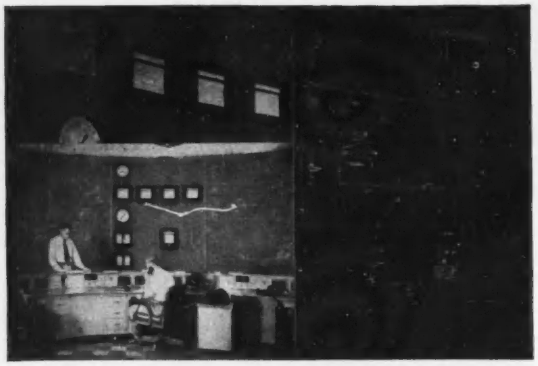
ADEQUATE CHARGING CAPACITY ESSENTIAL TO FULL-FLOAT SERVICE

Stationary batteries perform many services, from low-ampere alarm systems to 120-volt switchgear installations. For this reason, care should be taken to select charging equipment with proper capacity to meet the battery's special application. For alarm systems, all that is necessary is to choose equipment with sufficient capacity to supply the comparatively low current demands required and keep it in full-float condition. For telephone or emergency applications, charging equipment should be selected with sufficient capacity to completely recharge a battery in approximately 24 hours. In important stations, it may be necessary to recharge a fully discharged battery in from 8 to 12 hours.

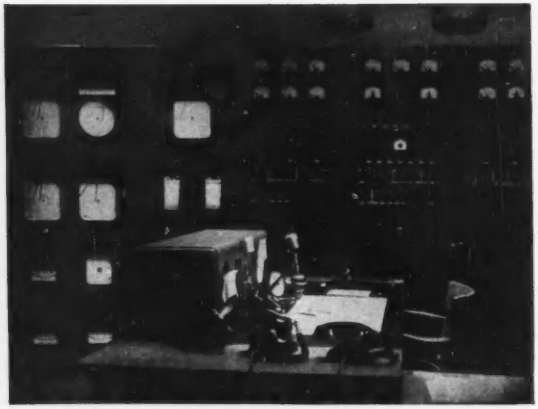
GOULD STORAGE BATTERIES

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries



METAMETER AT BONNEVILLE AND GRAND COULEE DAMS. Bristol strip-chart Metameters are used by the Bonneville Power Administration. The receivers shown above are installed on the Bonneville dispatcher's board at the H. D. Ross Substation, Ampere, Washington, and record Bonneville 230 KV, Bonneville total power, Coulee total power (transmitted from Grand Coulee Dam approximately 250 miles away), and system total power.



METAMETER AT ROCKLAND LIGHT AND POWER COMPANY, MIDDLETOWN, N. Y. The 15 Metameter indicating receivers at right show kilowatts, water levels and kilovars at three hydro-electric power plants. The three at left measure and record pressure of delivered gas, and integrate flow into the Company's distribution system at points up to 50 miles away. The other Bristol instruments totalize flow during a given period of time in the three supply lines and also give a continuous reading and a chart record of total instantaneous flow through all three lines.

DISPATCHING MADE EASIER

Bristol Metameter* telemeters give the dispatcher up-to-minute readings of electrical and other measurements made many miles away

A complete and continuous visual picture of what is happening at key points throughout the system enables the dispatcher to accurately appraise conditions instantly and act with full knowledge.

With information from his Metameter receivers, he can keep in touch with load changes and direct the generation and transmission of power more economically and with greater ease. He can foresee emergencies and take the necessary steps to maintain schedules. Often, he can increase safe maximum loads in tie lines considerably.

Among the types of information Bristol Metameter telemeters make available to the load dispatcher are: the load at each tie-line point, output of each generating station, totalized output (on one instrument) of all generating stations, active and reactive power and power demand at key points, voltage and current at various points.

Generating stations use Metameter for information on output of each associated station (attended or unattended), total output, water level and water wheel gate position, water level in reservoirs, surge tanks, etc.

Readings can be transmitted any distance, over any two-wire circuit or its equivalent, carrier-channel, telephone, telegraph or radio (including microwave) . . . to recording receivers (narrow or wide-strip chart or round chart) or indicating receivers.

Metameter is the tried-and-proved telemetering system. Thousands are in use on all types of service. Write us for Bulletin M1700. THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.

Reg. U. S. Pat. Off.

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

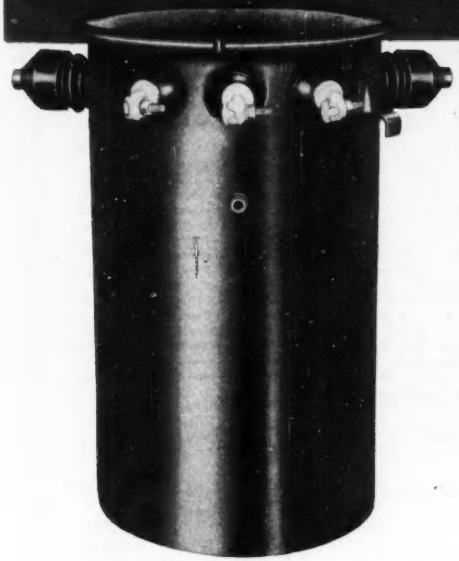
Wagner
TRANSFORMERS
...the choice of leaders in industry

3 REASONS WHY

Wagner

Form W TRANSFORMERS

pay dividends in Extra Service



Wagner maintains 31 branch offices in principal cities for quick, convenient engineering service. Consult the nearest branch on your next transformer installation.

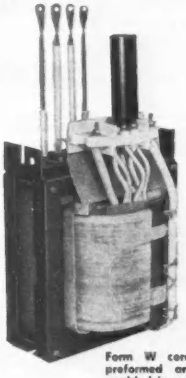
1 SHUR-SEAL COVER

The new method of fastening the cover to the tank that provides true sealed tank construction. "Breathing" is prevented and no leakage of oil can occur. The SHUR-SEAL Clamping Ring maintains equal pressure *all around* the cover —yet permits easy removal of the cover by loosening a *single* stainless steel bolt.

The V-shaped cross section SHUR-SEAL Clamping Ring securely locks the cover to the tank to assure an air-tight seal.

2 IMPROVED CORE AND COIL DESIGN

Form W elements, with preformed cores of cold rolled, oriented grain steel permit the construction of small size, light weight, yet liberally designed transformers. Form W Transformers give excellent electrical performance — core and copper losses are low . . . short time overload capacity is high.



Form W cores are preformed and assembled in rectangular shape to provide a path for the magnetic flux parallel to the grain of the steel.

3 BUILT TO GIVE EXTRA VALUE

Wagner Form W Transformers are built the Wagner way—with the use of only the highest quality materials, carefully controlled production methods, and the skill acquired in sixty years of transformer building experience. That's why they pay dividends in longer service life.

Wagner Electric Corporation
1891 1951

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

TSI-9

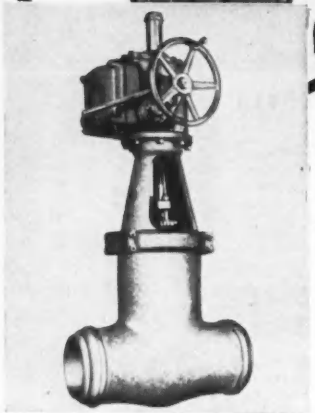
POSITIVE, SAFE AND AUTOMATIC

Push-Button

OPERATION OF VALVES

BY

Limitorque CONTROLS



Above—Type S LimiTorque Control on Crane Valve

LimiTorque Controls are available for all types of valves and may be supplied for actuation by any power source such as electricity, steam, gas, oil or air. Your valve manufacturer can supply them.

Send for our 96 page catalog L-50.

Please make request on your business letterhead.

-has been installed in the following

Central Stations and Power Plants

Arkansas Power & Light Co. • Boston Edison Co. • Brooklyn Edison Co. • Carolina Power & Light Co. • Central Arizona Light & Power Co. • Central Illinois Electric & Gas Co. • Cincinnati Gas & Electric Co. • Cleveland Electric Illuminating Co. • Commonwealth Edison Co. • Ridgeland Station, Fisk Station, Northwest Station • Central Illinois Public Service Co. • Central New York Power Corp. • Connecticut Light & Power Co. • Consolidated Gas of Baltimore • Dallas Power & Light Co. • Florida Power & Light Company • Ginnevilliers Power Station—France • Hawaiian Electric Co.—Honolulu • Houston Light & Power Co.—Houston, Texas • Iowa Electric Light & Power Co. • Illinois Power Co. • Kansas City—Municipal Plant—Kansas City, Kansas • Louisiana Power & Light Co. • Mississippi Power & Light Co. • Montana Power & Light Co. • Minnesota Power & Light Co. • New York Edison Co.—New York City, East River Station, Hell Gate Station, Waterside Station • Nebraska Power Co.—Omaha Steam Electric Station • Oklahoma Gas & Electric Co. • Public Service of New Jersey, Burlington Station, Essex Station, Sewaren Station • Phoenix Utility Co.—Arizona • Potomac Electric Power Co. • Philadelphia Electric Co., Richmond Station, Schuylkill Station • Southern California Edison Co. • Tampa Electric Company • Utah Power & Light—Salt Lake City • Virginia Public Service • and many other important stations.

Hydro Electro Plants

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Argentina Electric Company
Canadian Hydro-Electric Comm. —Ontario
Grand River Hydro-Electric Station—Oklahoma
New York Power & Lighting Co. —Spiers Falls, N. Y.
Niagara Hudson Company — Trenton Falls, New York
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*LimiTorque is a registered trademark of Philadelphia Gear Works, Inc.

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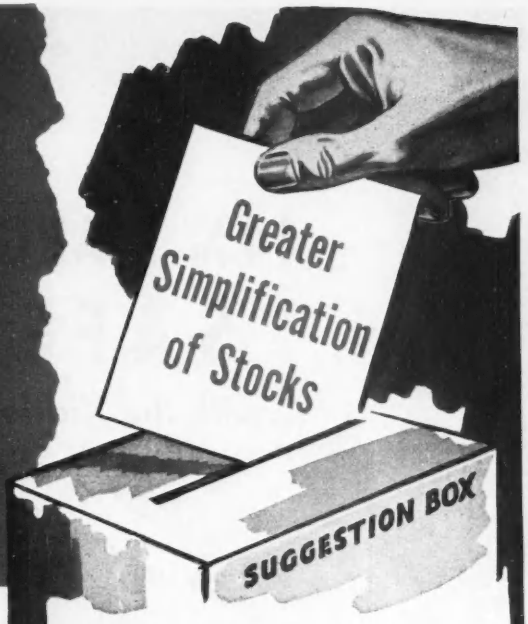
Industrial Gears and Speed Reducers
LimiTorque Valve Controls

GOOD IDEA FOR CUTTING HIGH COST OF INVENTORY MAINTENANCE



Taxes, insurance, rentals, freight, storage, building maintenance, purchasing and accounting operations . . . all are costs of maintaining your inventory of materials and supplies.

In dollars and cents, these costs will range from 5% to 30% of inventory value, depending on local conditions under which you operate. For example, if you purchase $1,000,000 worth of materials and supplies a year, at 10% it costs you $100,000 a year just to maintain this inventory.

Today, to help offset the effect of rapidly mounting operating costs, many utilities are reducing the cost of inventory maintenance through further standardization and simplification of stocks.

If you're one of these, Locke can help you.

The industry's only guide to reduced inventory maintenance costs through simplification of Pole Line Hardware Stocks.

SIMPLIFICATION MADE EASY WITH LOCKE'S *RM HANDYLOG

It's the perfect tool for men working toward further simplification of Pole Line Hardware stocks. It lists ONLY the standard items which you need. By using it, you stock fewer items. Each item is a fast mover. Each is regularly in production, and carried in stock by your Locke Regional and Distributors' Warehouse. If you haven't got a copy of Locke's *RM Handylog, write for one today. Place the items in it on your standards list. Do this and you'll be taking the industry's only practical short-cut toward further standardization and simplification of Pole Line hardware stocks. Locke Department, General Electric Company, Baltimore, Maryland.

*RM (Repetitive Manufacture) *A program designed to help reduce the installed cost per kilowatt on line and station equipment.*

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Before you buy stop! **See what Locke's Got!**

44% MARGIN OF SAFETY

...with the Kidde Dry Chemical Extinguisher

Kidde Dry Chemical Extinguishers shield the operator from the flames with a heat-absorbent curtain of fine powder. The Kidde 20 pounder covers 36 square feet—44% MORE AREA than required by Factory Mutual Laboratories. The Kidde 30 pounder covers 48 square feet—as compared to the 35 square feet required by Factory Mutuals.

These Kidde extinguishers drive the dry chemical with enough force to overcome updrafts caused by the heat of the fire. The special Diffuser Horn applies the powder in a cloud-like pattern—helping to eliminate the splash of flammable liquids and offering the greatest protection to the operator.

For fires in textiles, flammable liquids and live electrical equipment Kidde Dry Chemical Extinguishers are highly effective. Write for information on portable or wheeled units.

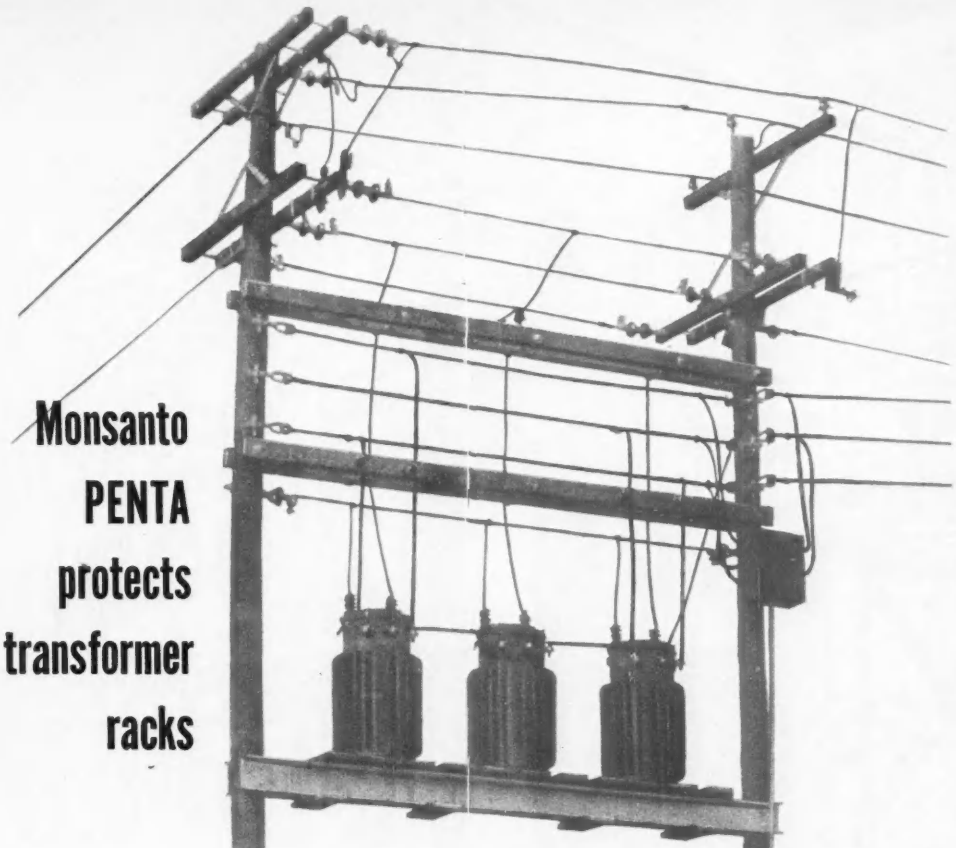
Kidde

The word "Kidde" and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc., 1230 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Monsanto PENTA protects transformer racks



Extra years of service have been added to the life of transformer racks installed by the Belfalls Electric Cooperative, Inc., of Rosebud, Texas, because the wood is protected by Monsanto Penta preservative.

"Penta was applied by brush," says Mr. Alvin L. Freeman, manager of the cooperative, "and we are well pleased with the treatment's penetration."

Monsanto Penta can be applied by brush, as well as by dip and pressure methods. Brush treatment makes it possible to protect structures already erected.

Properly formulated penta is a *clean* treatment. It protects poles and crossarms from decay due to fungi and from attack by termites and other wood-boring insects. Penta, a stable chemical, gives uniform, long-lasting protection. It is insoluble in water and does not leach. Penta treatment does not change dimensions of wood nor corrode common metals.

For technical data on the use of Monsanto Penta preservative, for sources of penta-protected lumber or for names of firms that will custom-treat your wood, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

Where To Use Penta Preservative

Poles and Crossarms • Planks covering underground cables • Transformer platforms • Sills and plates • Joists and girders • Screeds and subflooring • Flooring • Roof planks • Platforms and decking • Posts and fences • Cooling towers • Millwork • Guardrails • Truck beds • Construction timbers.

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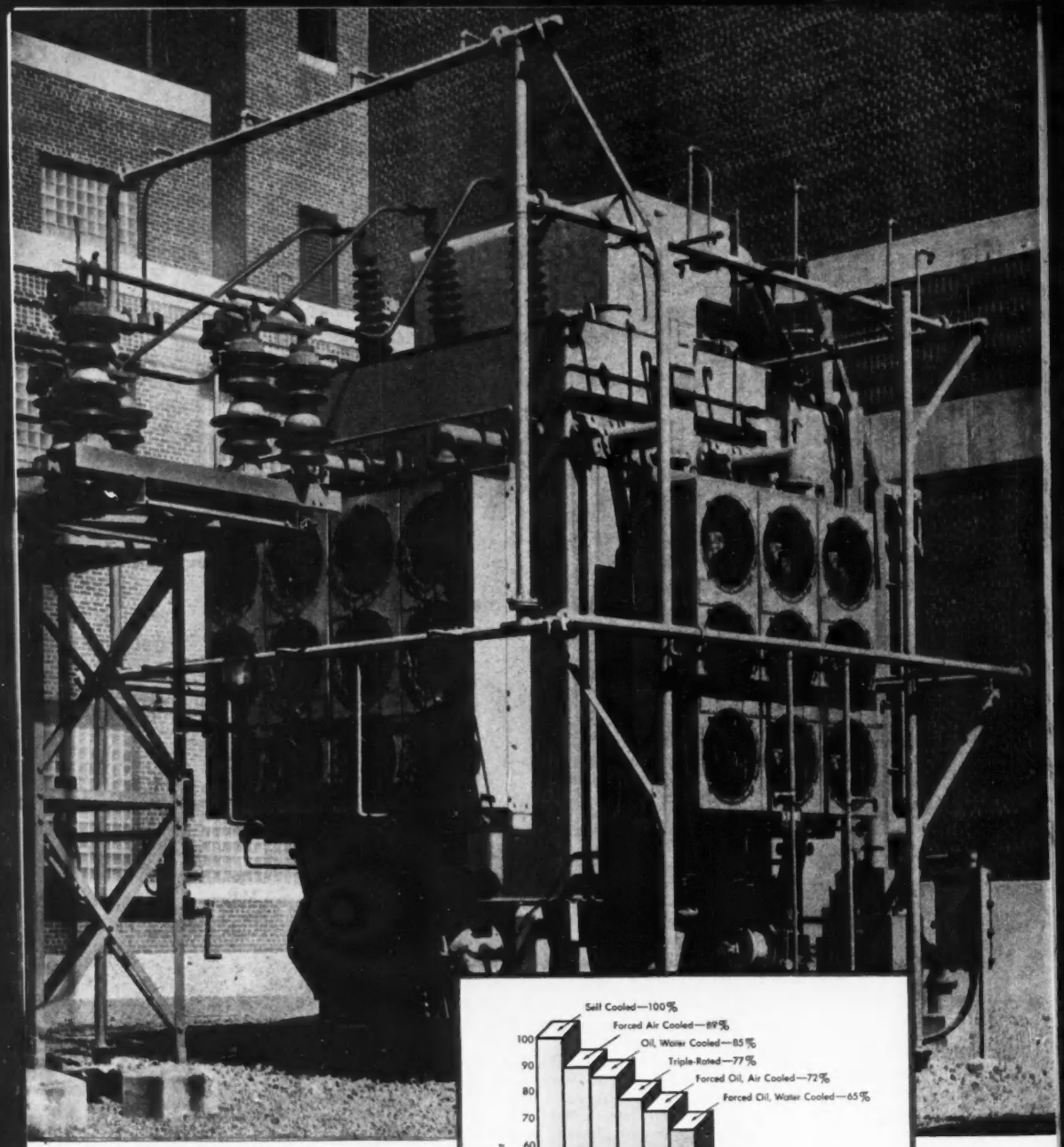
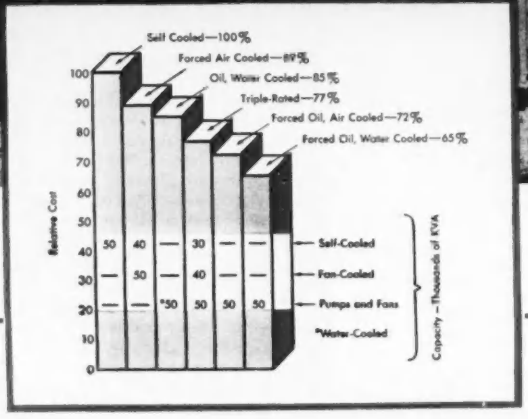
Serving Industry . . . Which Serves Mankind





Cost and performance comparison of 50,000 kva, 115 kv, three-phase transformers for different methods of cooling.

ADVANCED COOLING TECHNIQUES

Cut Capital Investment 15% to 35%

Three-phase power transformers provide substantial savings over single-phase banks. That's well recognized. In many instances, the savings run as high as 28%.

But modern cooling, applied to three-phase transformers can bring even greater savings.

Consider the cost of a three-phase, self-cooled transformer as a 100% base. Then a modern external water cooler (OW) permits a reduction of 15%. The use of forced-oil, forced-air cooling (FOA) can bring a cut of 28%. And, for some applications, a combination of forced-oil cooling *and* external water cooling (FOW) can effect a total savings of 35%.

Thus, through application of advanced cooling techniques alone, substantial cuts can be made in the cost of three-phase transformers... savings that can be brought to 50% and more, as compared to the cost of single-phase transformer banks.

WESTINGHOUSE POWER TRANSFORMERS are smaller and lighter per kva than any other transformer on the market. As a result, you can expect these additional savings:

1. **Reduced space required.**
2. **Smaller foundations.**
3. **Smaller superstructures.**
4. **Lower field-assembly expense... transformers shipped more completely assembled.**
5. **Lower maintenance expense... rugged, all-welded construction plus smaller size.**

Yet all this is merely a portion of the savings possible with Westinghouse Transformers. Our representatives will be glad to discuss additional features that mean big savings to you. Phone today, or write: Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Penna.

J-70579

WESTINGHOUSE POWER TRANSFORMERS ARE SMALLER AND LIGHTER PER KVA THAN ANY OTHER TRANSFORMER YET THEY GIVE SUPERIOR PERFORMANCE

YOU CAN BE SURE... IF IT'S

Westinghouse

POWER TRANSFORMERS

LONG JOHN* puts plenty of space between aerial cable and pole....

effectively preventing chafing of cable on outside corners

"LONG JOHN" is for outside corners only, so you won't need him as often as our other Aerial Cable Clamps, but you only need one outside corner to learn how useful he can be, particularly when straight lay cable is used.

MIF Aerial Cable Clamps offer *maximum flexibility*. A wide range of spacing is available, as detailed in the specification table below.

MIF Aerial Cable Clamps permit placing the messenger above or below the through bolt to comply with your practice or to meet special conditions.

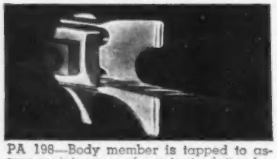
MIF Aerial Cable Clamps simplify corner installations as the belled ends of the messenger grooves permit turns of from 30° to 90°, depending on the clamp.

MIF Aerial Cable Clamps have a pole-conforming base (the feet are tangential to average pole diameter). Large pads and spurs transfer the load to the pole in such a way as to minimize overturning and slotting down. The relation of the Clamping Plate to the Body Member is carefully worked out so that the load is supported by the Body and wedging of the messenger is avoided.

MIF Aerial Cable Clamps *combine in one device* a Clamp, Support, Spacer, and Pole Plate.

PA 192A—Messenger above through bolt. Note clearance from pole and belled ends of messenger groove.

PA 192A—Messenger below through bolt. To place messenger above through bolt clamp is reversed.



PA 198—Body member is tapped to assure maintenance of constant relation between Body member and Clamping Plate.

PA 198—Messenger below through bolt. To place messenger above only Clamping Plate is reversed.

SPECIFICATIONS

	HEAVY DUTY CLAMPS			SINGLE BOLT LIGHT DUTY CLAMPS	
	PA 192A	PA 178	PA 193	PA 197	PA 198
Messenger diameter, range	5/16"—½"	⅜"—⅝"	5/16"—½"	#6 A.W.G.—½"	#6 A.W.G.—½"
Clearance—face of pole to center of messenger	2¼"	2½"	6"	1½"	2"
Maximum size of through bolt accommodated	⅝"	⅞"	⅝"	⅝"	⅝"
Clamping bolts (2 of each)	½" x 2"	⅝" x 2"	½" x 2"	Through bolt serves as Clamping Bolt	
Maximum recommended load (vertical)	2500 lbs.	4000 lbs.	——	1800 lbs.	1800 lbs.
Shipping weight per 100 pieces	290 lbs.	520 lbs.	575 lbs.	90 lbs.	105 lbs.

PATENTS APPLIED FOR

MALLEABLE IRON FITTINGS CO.

Pole Hardware Div., Branford, Conn.
N. Y. Office, 30 Church St.

Representatives: William J. Cottrell Company, Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engineering & Equipment Corp., Los Angeles, Cal. • JSG Electric Company, Chicago, Illinois • E. A. Thornwell, Inc., Atlanta, Georgia • J. P. Voight, Summerville, S. C. • Waltham, De Witt & Krusi, San Francisco, Calif. • L. B. Ward Company, Dallas, Texas • L. G. Wendegatz, Kansas City, Mo. • Williams Sales Agency, Fort Myers, Fla. • Williamson Sales Company, Shreveport, La. • O. C. Witte Company, Detroit, Mich. Line & Cable Accessories, Ltd., Toronto, Canada

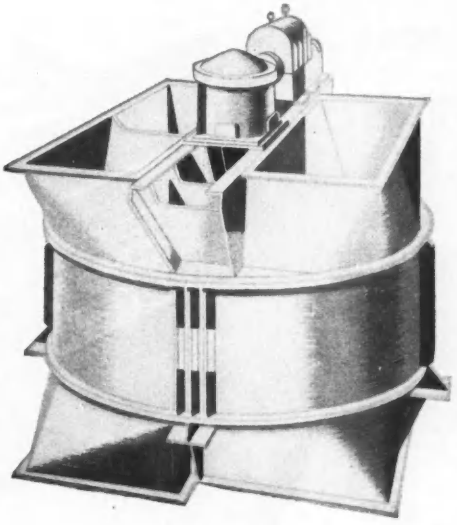
this preheater is cutting fuel costs in hundreds of plants!

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

The Ljungstrom air preheater has proved its value in industrial and utility plants throughout the country. That is why every year a constantly increasing percentage of the installed boiler capacity is equipped with Ljungstrom air preheaters.

Your fuel costs will be lower too, when your boiler is equipped with the Ljungstrom air preheater. The regenerative design of the Ljungstrom permits reliable operation at low exit gas temperatures. This assures the greatest possible heat recovery . . . reduces the amount of fuel required.

If you are planning a new installation, or expanding your present one, our engineers will welcome the opportunity to show you how the Ljungstrom air preheater can raise the overall efficiency of *your* plant.



THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

CHEMICAL PROCESS INDUSTRIES:

Here's Your Guide to

For The Electrolytic Production of:

- CHLORINE
- HYDROGEN
- OXYGEN
- SODIUM M
- FLUORINE
- COPPER
- ZINC
- ALUMINUM
- MAGNESIUM
- MANGANE

SEND FOR YOUR COPY OF BULLETIN 5106 TODAY!

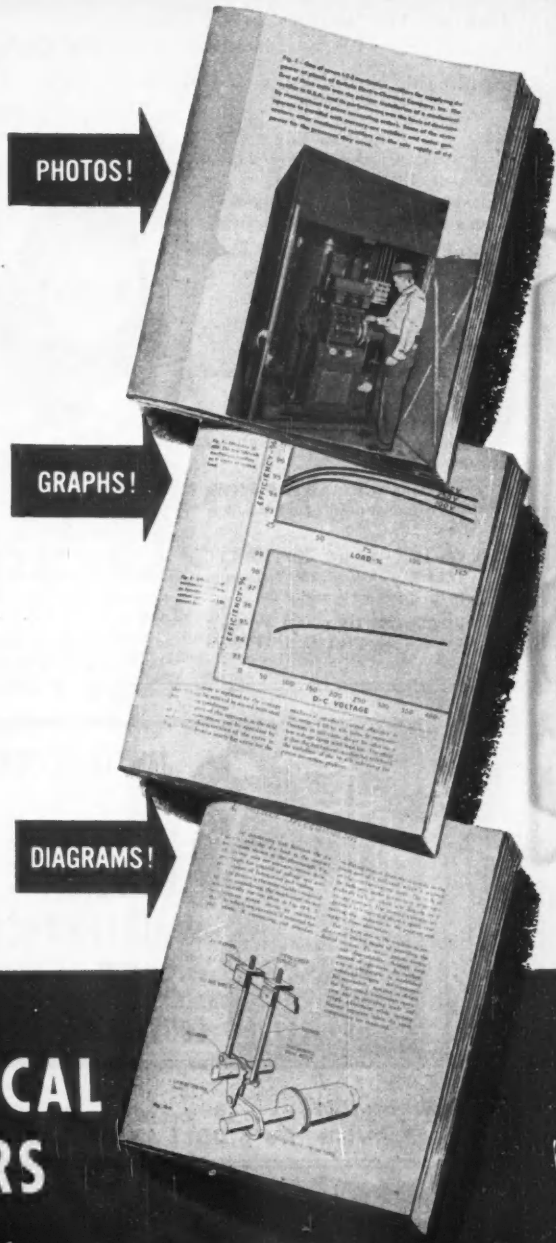
More Efficient Power Conversion

How you can get *95 to 97 per cent rectifying efficiency* for electrolytic production of chemicals at 3000 amperes and up is told in I-T-E Bulletin 5106.

Here is the story of the I-T-E Mechanical Rectifier—how it offers you direct current at lower cost; how its efficiency and economies in installation, operation and maintenance will save you money all along the line. Now you can plan your cell layout the way you want it—and get all the advantages of using low d-c voltages—greater safety to personnel —lower leakage losses to ground.

This comprehensive 32-page bulletin is packed with informative charts, diagrams and illustrations explaining the Mechanical Rectifier's operation.

Bulletin 5106 is yours for the asking. Send for it today. I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.



I-T-E

MECHANICAL RECTIFIERS

BIDDLE

Instrument News

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

NUMBER 1 OF A SERIES

JAMES G. BIDDLE CO., 1316 ARCH ST., PHILADELPHIA 7, PA.

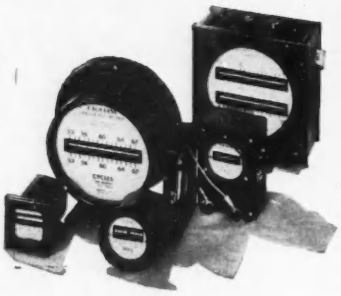
FREQUENCY MEASUREMENTS MADE EASY with FRAHM® RESONANT REED FREQUENCY METERS

Indicate Alternating Current Frequency from 15 up to 1500 Cycles per Second

Applicable to Pulsating or Interrupted D-C as well as to A-C Supply Circuits

Here are other advantages of Frahm Resonant Reed Frequency Meters gained by the simplicity and unfailing accuracy inherent in these instruments.

- **DEPENDABLE**—permanent calibration is a natural characteristic of tuned reeds.
- **STURDY**—there are no delicate pivots, jewels or moving parts.
- **LITTLE MAINTENANCE**—the result of simple, sturdy construction.
- **NO WAVE-FORM ERRORS**—resonance is a function of the driving frequency only.
- **INPUT VOLTAGE IS NOT CRITICAL**—accuracy is independent of supply voltage.
- **UNAFFECTED BY EXTERNAL FIELDS**—damping effect on natural reed frequencies is negligible.
- **INDEPENDENT OF LOAD, POWER FACTOR or PHASE SHIFTS** in supply circuit.



FRAHM Frequency Meters are available in switchboard, miniature and portable types. We invite correspondence regarding applications which require special modifications of range, method of actuating, scale graduations or other design characteristics.

We'll send you a bulletin that contains a wealth of information on this subject. Write today for Bulletin 32-W.

You are invited...

To Visit the BIDDLE EXHIBIT at BOOTH 510

(Model 1B—Battery Operated Set)

FOR LOW-RESISTANCE MEASUREMENTS BETWEEN 100 AND 10,000 MICROHMS

Megger® Low Resistance Ohmmeters in Portable Types for Field and Shop Use

Self contained battery-operated and rectifier-operated types of Megger Low Resistance Ohmmeters have just been developed. They are designed for hard routine and emergency service in measuring contact resistance, such as in circuit breakers, relays, switches, bonds, connections and joints, commutator bar-to-bar tests and the like.

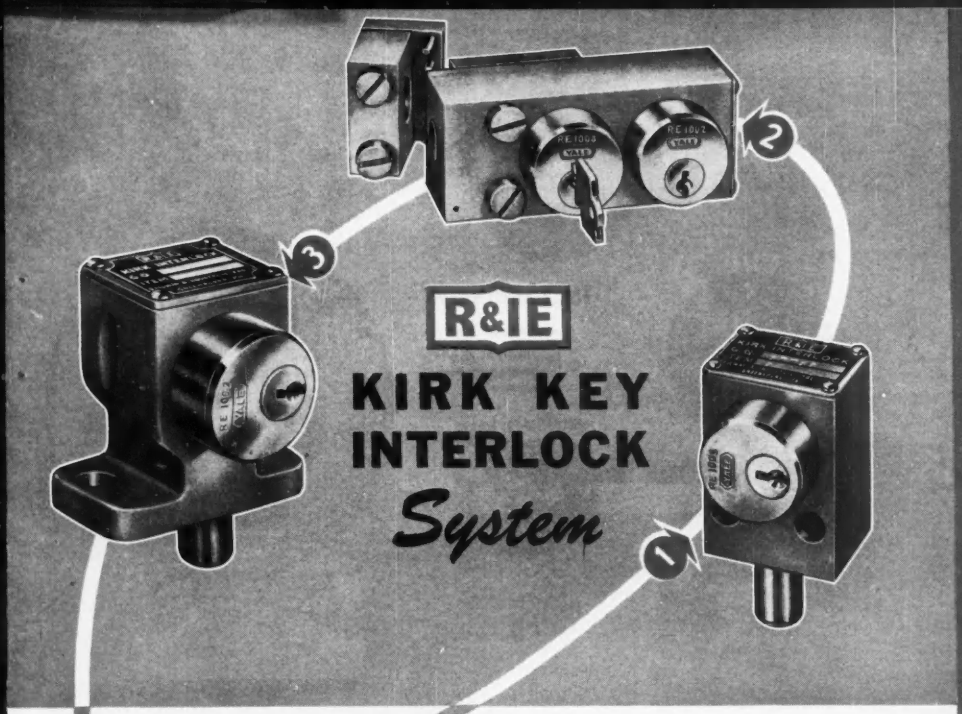
These portable instruments (weight 19 lbs.), are designed for low resistance measurements in the shop and in the field. They are of moderate cost and are accurate to within 1.5% of full scale deflection.

Model 1B operates from two 4 FH dry cells mounted inside the case.

Model 1R operates from a rectifier, built inside the instrument case, for connecting to 115 volts, 50-60 cycles.

Both models have a range of from .001 to .010 ohms. These new instruments operate on the same crossed-coil ohmmeter principle as the Ducter Low-Resistance Ohmmeter, with pointer indications of resistance and no necessity for balancing or voltage adjustment. Scales have fairly uniform graduations and are approximately 3¼" long. Anyone can operate this equipment—no special training or experience is required.

For particulars and prices write for Bulletin 24-46-W.



R&IE

KIRK KEY INTERLOCK *System*

KEY . . . YOUR OPERATIONS FOR SAFETY

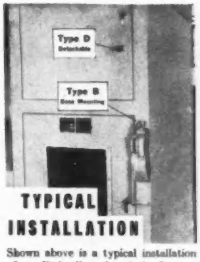
Kirk Key Interlock Systems prevent the authorized person from doing the unauthorized thing! Added safety for your installation and equipment is provided by this device which is applied to two or more movable parts, preventing or allowing movement of one part only when another part is locked in a predetermined position. Unlimited operating schemes can be arranged in electrical installations, processing systems, fluid and pneumatic systems, etc., from combinations as shown, or multiple units of any one of them. Individual locks are mechanical and meet basic mounting requirements. Following are descriptions of the 3 types shown above:

1. **TYPE F**—For flat mounting—Can be mounted on any protective device.

2. **TYPE D**—Detachable....Can be mounted on cell door, gate or compartment. One key retained with door locked open....other key can be retained by operator or used to operate other devices.

3. **TYPE B**—For base mounting—Can be mounted on handle of disconnecting device....Key released when lock is open.

Please write for Bulletin No. 1725 for full description, applications and typical schemes for R&IE Kirk Key Interlocks



TYPICAL INSTALLATION

Shown above is a typical installation of a Kirk Key Interlock System. Fuse compartment can only be opened when interrupter switch is locked open.

RAILWAY and INDUSTRIAL ENGINEERING CO., Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

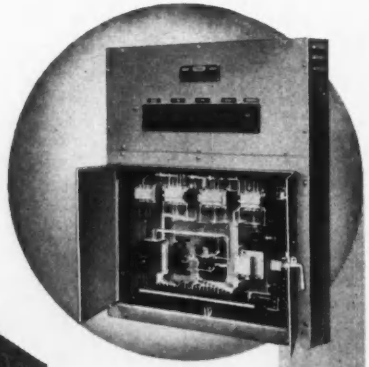
AN I-T-E SUBSIDIARY

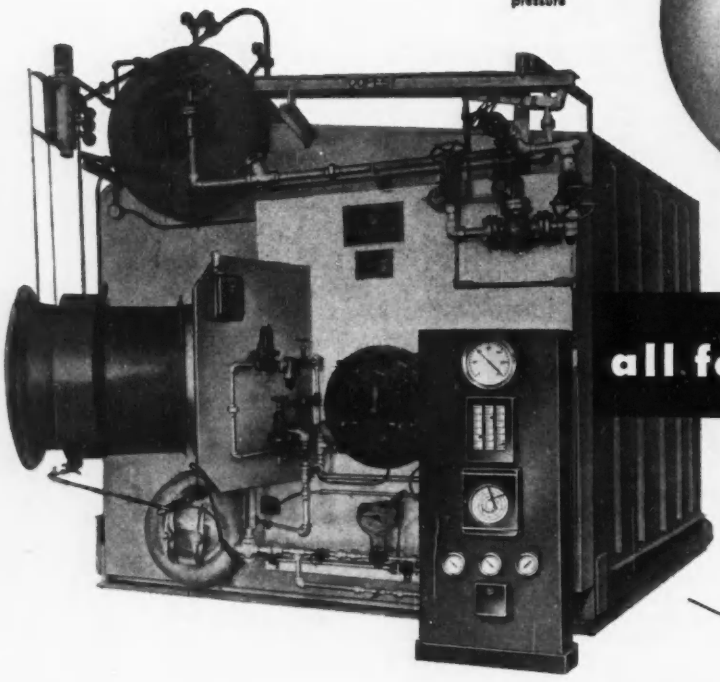
The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SWITCHING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

FULLY AUTOMATIC

- push-button start
- operation at all pressures up to design pressure

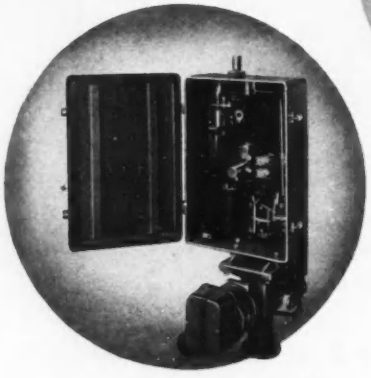


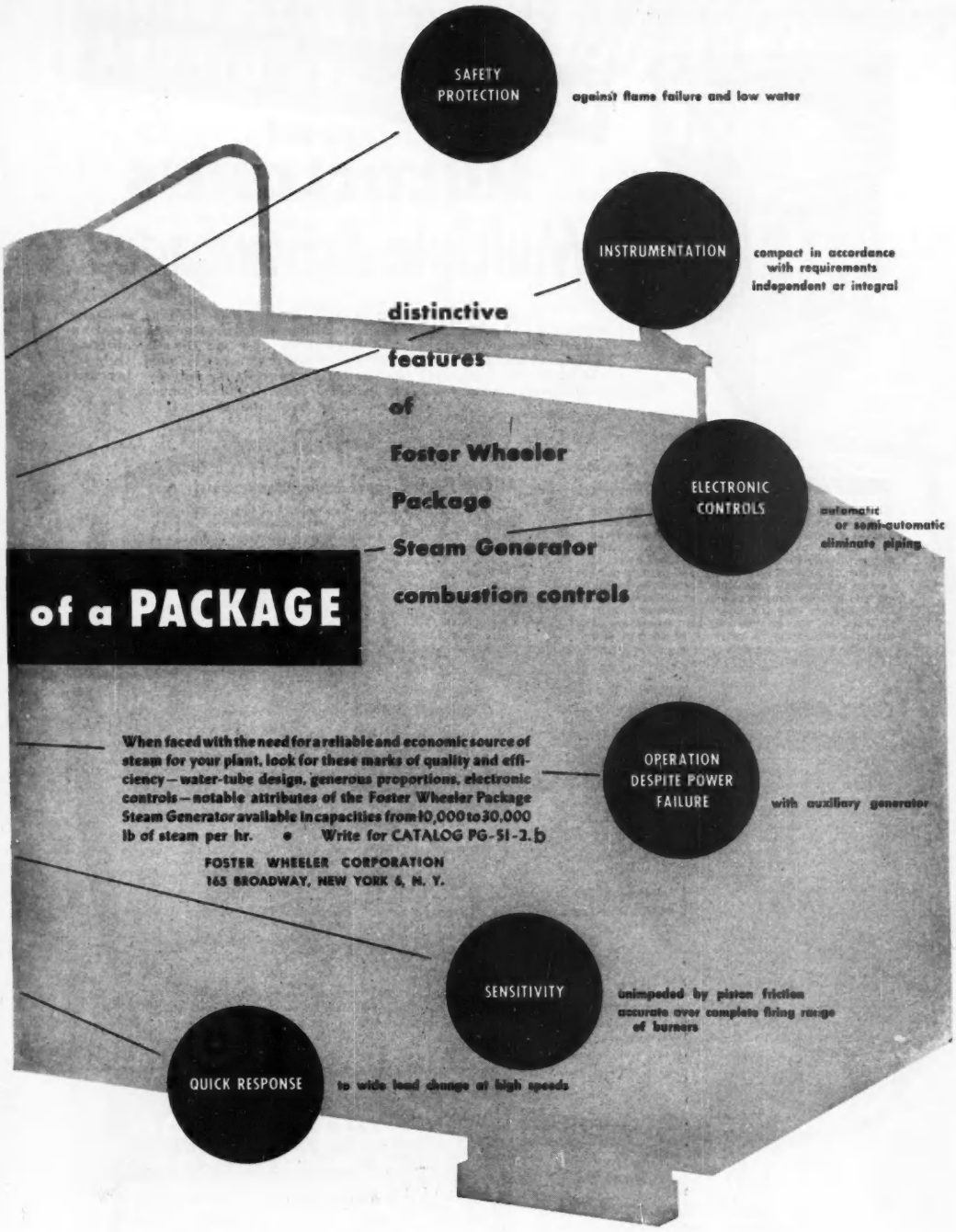


all for the price

SEMI-AUTOMATIC

- manual ignition
- wide operating range
- modulating control




SAFETY PROTECTION
against flame failure and low water
INSTRUMENTATION
compact in accordance with requirements
independent or integral
distinctive features of Foster Wheeler Package Steam Generator combustion controls
ELECTRONIC CONTROLS
automatic or semi-automatic
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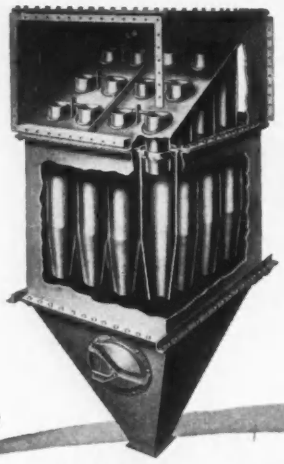
OPERATION DESPITE POWER FAILURE
with auxiliary generator
SENSITIVITY
unimpeded by piston friction
accurate over complete firing range of burners
QUICK RESPONSE
to wide load change at high speeds
FOSTER WHEELER

Before you buy *any* equipment for recovering dust or fly ash . . .



COMPARE ALL OTHERS against MULTICLONE'S Multiple Advantages

Because the advantages of MULTICLONE are so clear-cut, so vitally important, so far-reaching in the savings they make, we urge you to make a factual unbiased comparison of MULTICLONE dust and fly ash collection equipment against *any other* in the mechanical recovery field. Only by making such a comparison can you fully appreciate the major savings and greater performance you get by installing MULTICLONE Collectors!

COMPARE Recovery Efficiency!

It is a recognized fact that the separating efficiency of a cyclonic tube *increases* as the tube diameter *decreases* because smaller tubes generate greater centrifugal forces. The patented vane in the MULTICLONE makes the use of small tubes *practical* without complicated manifolding and permits compacting many small tubes into one simple, highly efficient unit. MULTICLONE's higher centrifugal forces throw out not only the large, medium and small particles, but also an unusually high percentage of the *extremely small* particles of 10 microns and less. Result—*more complete recovery of all suspended particles from the gas stream!*

COMPARE Space-Saving Compactness!

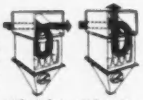
Plant space costs money—particularly at today's high construction costs. Because the MULTICLONE is more compact, size for size, it makes *really important* savings in space and plant costs. Note in the chart how the MULTICLONE requires substantially less space—*both in floor space and cubic space*—than any other unit of comparable capacity and performance. *This means vital savings in construction costs!*

Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

COMPARE Dollar-Saving Adaptability!

Savings in space is just one of MANY WAYS MULTICLONE reduces installation costs. Because the shape of the unit can be readily varied (long and narrow, short and wide, or square) to fit available spaces, the MULTICLONE can often be tucked into odd corners and waste areas too restricted for other equipment.

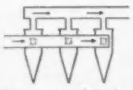
Moreover, inlet-outlet ducts can be varied—side-inlet side-outlet, or side-inlet top-outlet—to meet low headroom or restricted side clearance requirements . . . and the single-inlet single-outlet duct design permits greater flexibility and simpler installation. *These all add up to vital savings in installation costs!*



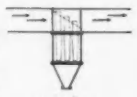
Side inlet, Side outlet ***Side inlet, Top outlet***

COMPARE All-Around Simplicity!

The MULTICLONE is simple and inexpensive to maintain because there are no highspeed moving parts to repair or replace . . . no pads or filters to clean or renew . . . nothing to choke the gas flow or increase draft losses as suspended materials are recovered. In addition, the square, flat-sided shape of the MULTICLONE and its straight inlet and outlet ducts are far simpler to install and insulate. And since the recovered material from an entire bank of tubes is collected in a *single* hopper, it is much easier to service and maintain than the multiple hoppers of conventional cyclone units. *Here again, the* MULTICLONE *saves in many ways—all of them important!*



Conventional Cyclone



Multiclone

Whether your recovery installation is in a new structure or for modernizing present equipment, you will be far ahead by installing MULTICLONE Collectors. Our experienced engineers will gladly make helpful suggestions for simplifying your recovery problems. A letter, wire or call to our nearest office places this assistance at your service without obligation.

Send for Helpful Literature! This factual MULTICLONE literature explains the basic principles of cyclonic dust recovery and gives technical data helpful to anyone contemplating a dust or fly ash recovery installation. Write today for your free copy!

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

INSULATED AGAINST *DOWN-TIME**

To help insure efficient operation with a minimum of costly "down-time," this giant 100,000-kw generator at Toledo Edison's Acme Plant is protected with Fiberglas† glass-base insulating materials.

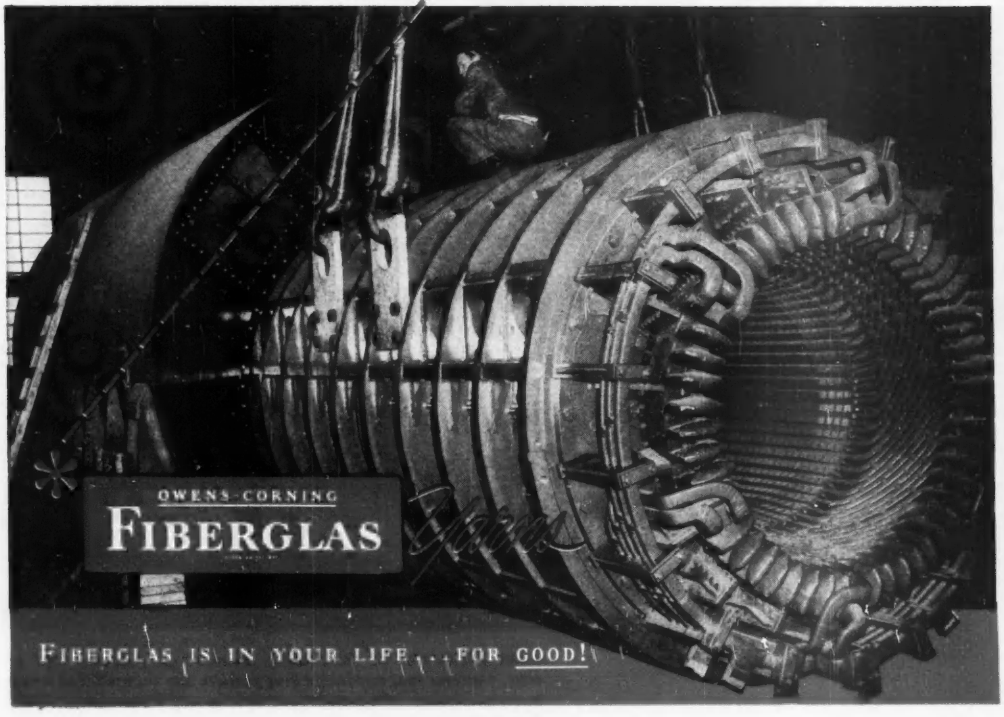
Now, when electric power must be supplied at constant high rates to maintain production for military as well as civilian needs, the superior qualities of Fiberglas insulations are needed more than ever.

High strength with small diameter, plus resistance to heat, moisture, rot, corrosion, and age, are just a few of the unique properties that make Fiberglas yarns ideal for virtually any type of electrical insulation.

Because of increasing military demands for Fiberglas yarns, manufacturers are often unable to get all they need. We are building new facilities to help meet these demands.

Write today for your copy of the 32-page book describing the many uses of Fiberglas materials in electrical insulation. Owens-Corning Fiberglas Corporation, Electrical Sales Division, Dept. 858, 16 E. 56th Street, New York 22, N. Y.

†Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibrous glass.

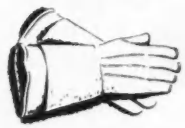


CLEAN INSTALLATIONS. Individually mounted or grouped, wye or delta, whatever your standard wiring practice may be, you'll find it easy to design cleaner, safer installations with the new Westinghouse "CSP" Transformers.

Put Yourself ON THE SPOT

Where clearance means SAFETY

Put yourself in these shoes, high on a pole top where clearance means safety. That's where you'll appreciate the new Westinghouse "CSP"® Transformers with wall-mounted, high-voltage bushings that give you better working clearance—where they eliminate long loops that swing dangerously in the wind.



Try on these gloves, and you'll agree that it's important to have a large insulated knob to make hand-tightening easy, eliminating the need for tools.

Now back to the desk, where statistics talk best. Your own figures* can show you it's good business to standardize on "CSP" Transformers . . . to take advantage of this lower installed cost, better service continuity. Extra features like "Coastal Finish", bushings with unbreakable Enrup† knobs, and Wemco C-I (inhibited) Oil make it pay to specify Westinghouse "CSP" Transformers. J-70588

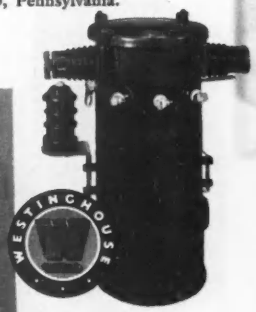
*If you have not yet made the detailed analysis of initial, installed and maintenance costs of "CSP" Transformers on the basis of *your own figures,* ask your Westinghouse representative for a copy of the check chart, B-4247B, "Transformer Costs and Their Relation to Profits". He'll be glad to give you details on the new product features, too. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

†T. M. Reg. U. S. R. Co.

YOU CAN BE SURE.. IF IT'S

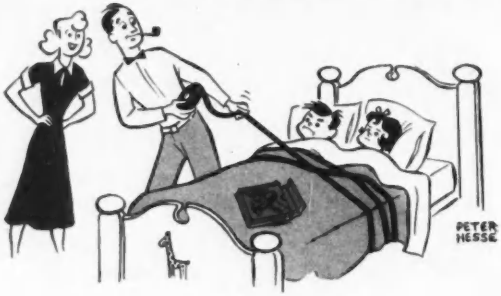
Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS



You can do a lot

with a little GOLD SEAL TAPE



When nothing else will serve, you can count on Gold Seal to stick to the job . . . to produce a longer-lasting bond every time. The reason? Laboratory-controlled production. It assures lasting "tack" in the friction compound.

A tape that will not dry out, peel or ravel not only makes for better taped joints—it *goes further*. You get more joints per *roll* of Gold Seal Tape –more *value*, because there's less waste.

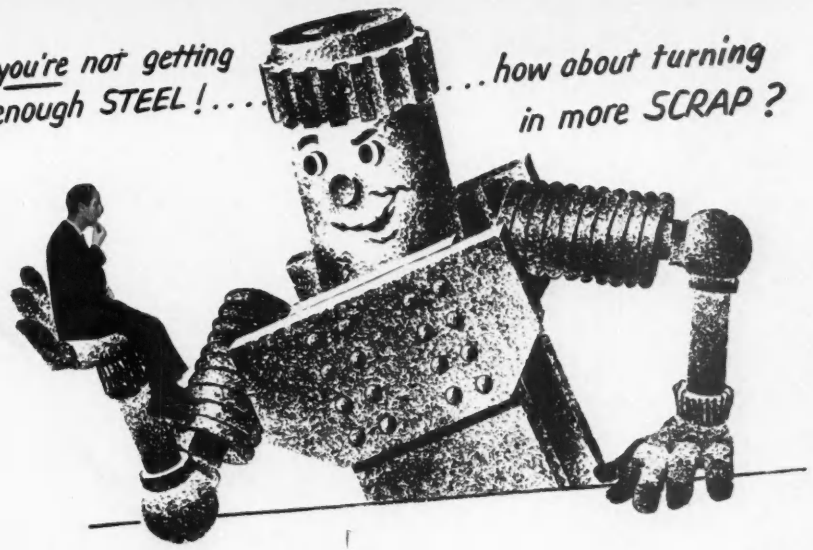
Next time, ask your supplier for Gold Seal. Test it on the job—for grip, for economy. See if you don't agree it's the best buy in tape. Packaged in single rolls and handy 10-roll containers. Each roll cellophane wrapped to keep it *factory-fresh*. Jenkins Bros. (Rubber Division), 100 Park Ave., New York 17, N. Y.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal Specifications.

JENKINS Gold Seal Tape

FRICTION and RUBBER TAPES

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES



There's only one quick way to get more steel!

...get more SCRAP to the mills, at once

LET'S be realistic about the scrap shortage. The need for scrap is desperate. It theatens to hamper our whole National Defense effort—and it vitally concerns *you* because it boils down to this:

Unless 100,000 tons of industrial scrap roll into the steel mills every day, steel production will drop, and there'll be *less* steel for everyone—you included.

On the other hand, if more scrap is turned in, more steel will be turned out—and the more steel that's made the more steel *you'll* get.

So—if you want more steel—do your full share in getting your scrap back to the mills. Comb through your plant, again and again. Tap every source of dormant scrap. Dig out every retired machine that you can possibly spare and rush it to your scrap dealer. Rip out any old rails and switches that are rusting away on unused sidings—and scrap them. Scrap your antiquated dies, jigs and fixtures, your worn-out tanks and boilers that are gathering dust in some forgotten corner. Make sure that not a single pound of scrap is by-passed. Sell it—ship it. It means good money for you, more scrap for the Nation's scrap pile, and more steel for *everyone*.

• • •

Remember—the Nation's productive effort depends primarily on steel—and steel depends on SCRAP . . . *your* scrap. Turn it in—NOW.

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

This page would ordinarily be used to tell you about

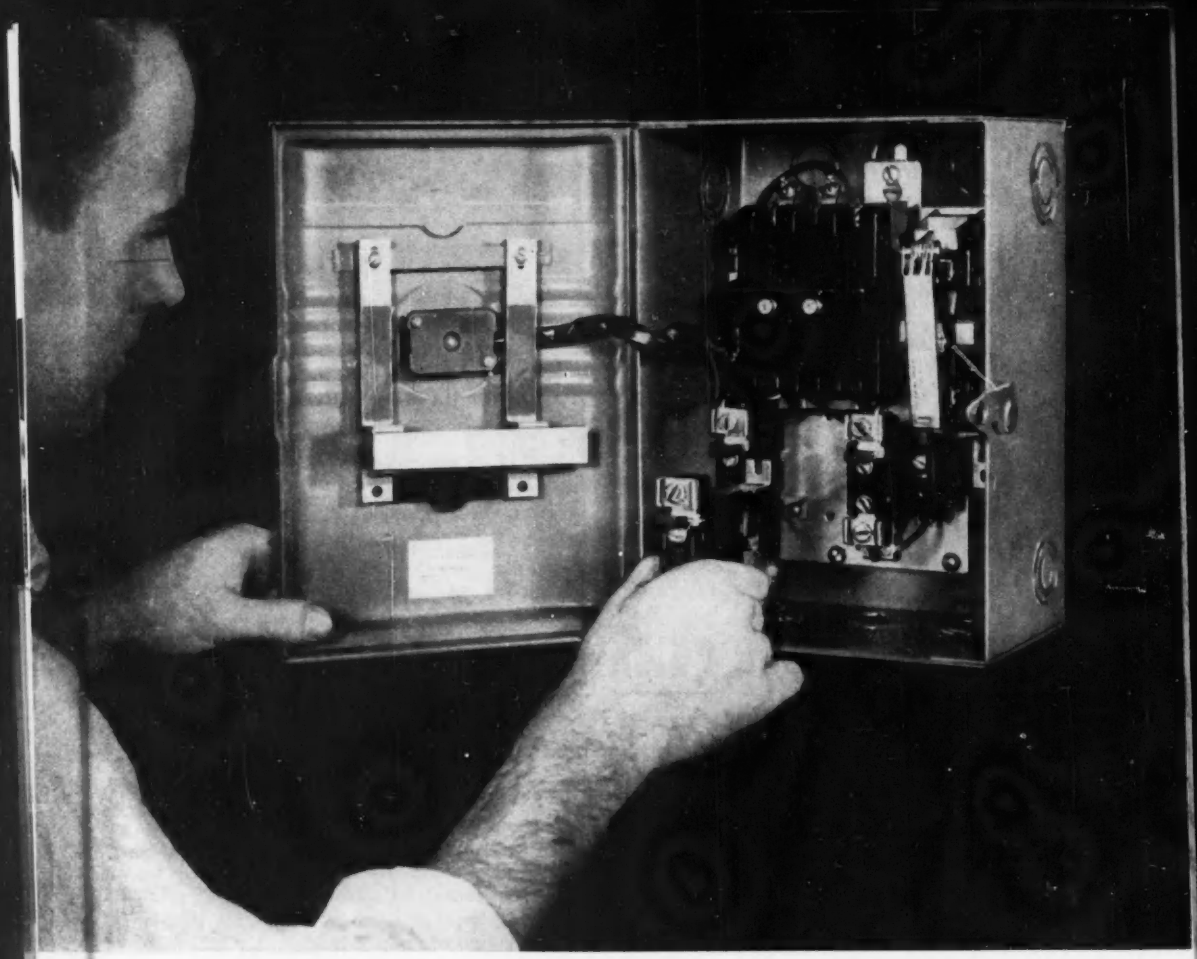
OUR STEEL WAREHOUSE SERVICE

but, because steel cannot be produced without SCRAP, we are asking instead for your all-out help in getting more SCRAP to the mills.

UNITED STATES STEEL SUPPLY COMPANY
WAREHOUSES COAST-TO-COAST

1-1903-A

UNITED STATES STEEL



TO THIS BASIC STARTER UNIT can be added a choice of selector switch or push-button stations, auxiliary contacts, transformers and extra overload relays.

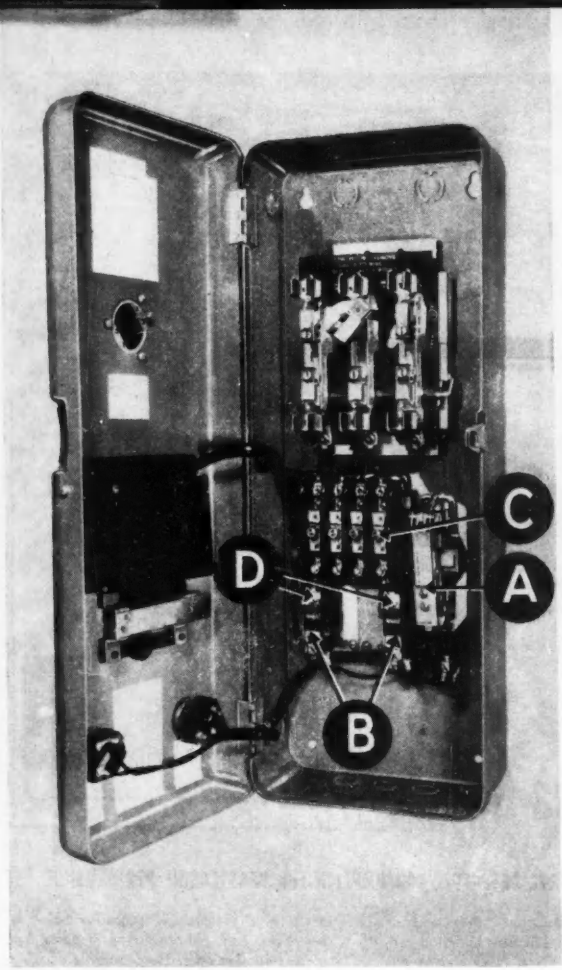
NEW LINE OF MOTOR CONTROL WITH PACKAGED ACCESSORIES

This magnetic starter unit is complete in itself, yet it's built to take on—in the field—additional control accessories.

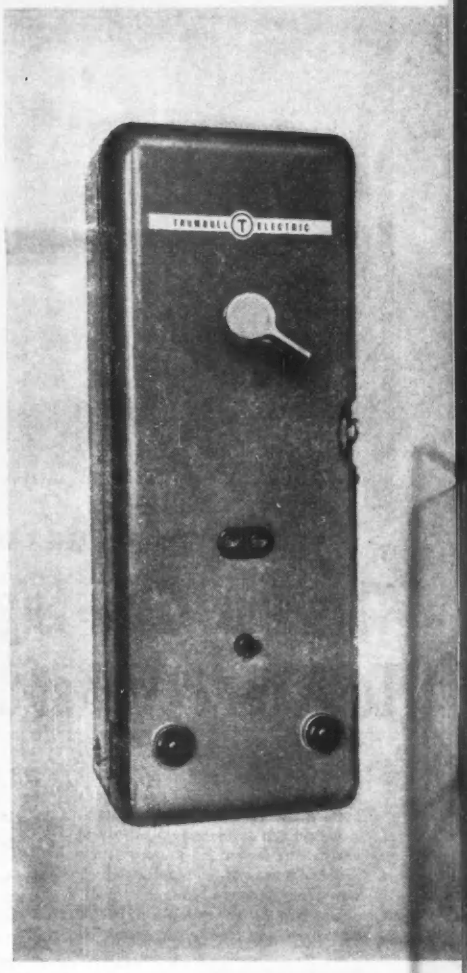
This latest Trumbull development—identified as HM motor controls—permits adding on to the basic starter unit such accessories as extra overload relays, auxiliary switches, selector switches, push-button stations, transformers, coils, etc.

Inventories, obviously, can be reduced. Fewer units can be made suitable for more jobs merely by installing the proper accessories in the field.

For full information on Trumbull's HM line of controls—sizes 0 through 3 for 110-600 volt service, fractional through 50 hp—address TRUMBULL ELECTRIC, Department of General Electric Company, Plainville, Connecticut, and ask for TEB-8.



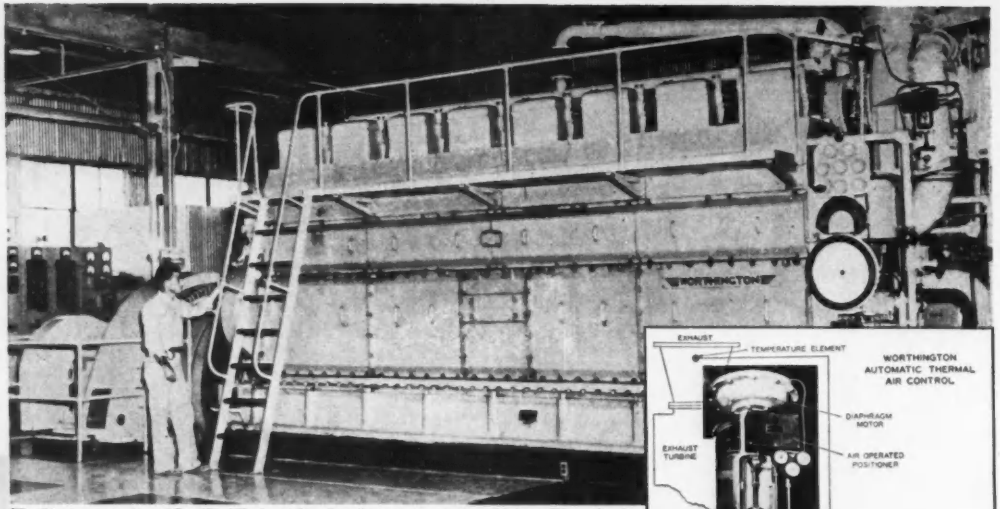
THE SAME MAGNETIC STARTER also comes combined in one enclosure with Trumbull's HCI (High Capacity Interrupter) or a circuit breaker disconnect. Note Trumbull's (A) time-proved clapper-type controller. Its self-aligning, shock-absorbing armature assembly protects coil, prevents chatter, prolongs contactor life . . . (B) new sensitive control circuit—trips only for dangerous overload or undervoltage conditions . . . (C) high-hardness, double-break contacts that are self-wiping and installed in dust-free vertical position, which also permits easy servicing and straight-through wiring . . . (D) overload relay shift lever that moves easily from one slot to another for quick change from manual to automatic reset.



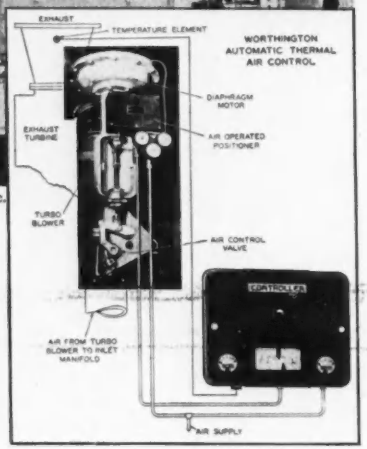
THIS TRIM-LINED ENCLOSURE combines a magnetic starter with circuit breaker disconnect and provides mounting space for all the various accessories. Note provision for padlocking. Easy to wire because complete interior can be removed simply by loosening the screws.

TRUMBULL ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONNECTICUT



Worthington supercharged Dual Fuel Engine at Casa Grande generation station of Arizona Edison Co., Inc.



On natural gas or oil...

This Dual Fuel Engine Makes Low-Cost Power at Casa Grande

Casa Grande, near Phoenix, is one of the more important power stations in the Arizona Edison Company system.

Although natural gas is plentiful and nearby, the station is equipped with a Worthington Dual Fuel Engine, which can change over to oil instantaneously.

That's so the type of fuel used can be determined day to day, depending on costs and availability. There are no switchover shutdowns.

This installation is just *another* illustration of the fact that Worthington has the right engine for *any* local condition—proof that Worthington can always help you increase efficiency and lower power production costs. For further information, write Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

THIS CONTROL CUTS FUEL CONSUMPTION FOR BEST ENGINE PERFORMANCE

The Worthington Automatic Thermal Air Control maintains optimum air-fuel ratio at all times. Result: better engine performance with lower fuel consumption at all engine loads.

This control is used exclusively by Worthington on super-charged dual-fuel engines. It is actuated by the exhaust temperature. Provides automatic variation of air quantity in direct relation to ambient air temperatures. Automatically compensates for changes in heating values of gas fuel. No other type of automatic controller offers these features.

Other exclusive features include dual plunger fuel oil injection pumps and micro-metering gas valves on each cylinder. They are further assurance of better, more economical operation of Worthington Dual Fuel Engines under all load conditions and with varying qualities of gas and fuel oils.

WORTHINGTON

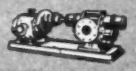
ENGINES E.1.6

ECONOMICAL CONTINUOUS POWER

Diesel Engines, 150 to 2640 hp
Gas Engines, 190 to 2880 hp
Dual Fuel Engines, 345 to 2640 hp

WORTHINGTON-BUILT AUXILIARIES

Engine Starting Compressors


Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Coolers

CONCERNING METERS –

"Penny-Wise...Pound Foolish"?

IN an attempt to save copper and other critical metals in World War II, the production of watthour meters was stopped and thousands of homes were served with flat rate power.

Was metal really saved?

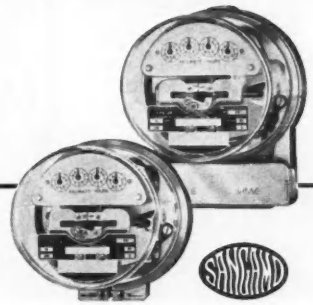
Let's look at the record . . . By the end of the emergency there were some 300,000 unmetered services. The result was uncontrolled, excessive consumption of power and inefficient use of generating, transmission, and distribution equipment—*all heavy users of critical copper.*

The waste entailed was proven by case histories which showed conclusively that when these services were eventually metered, both demand and total energy used dropped 40% or more!

Since concern for the production of heavy electrical equipment could cause the neglect of small tonnage use of metals, as required in the manufacture of watthour meters, consideration should be given the fact that *one pound of copper used in a meter saves as much as fifteen pounds* in generation, transmission, and distribution.

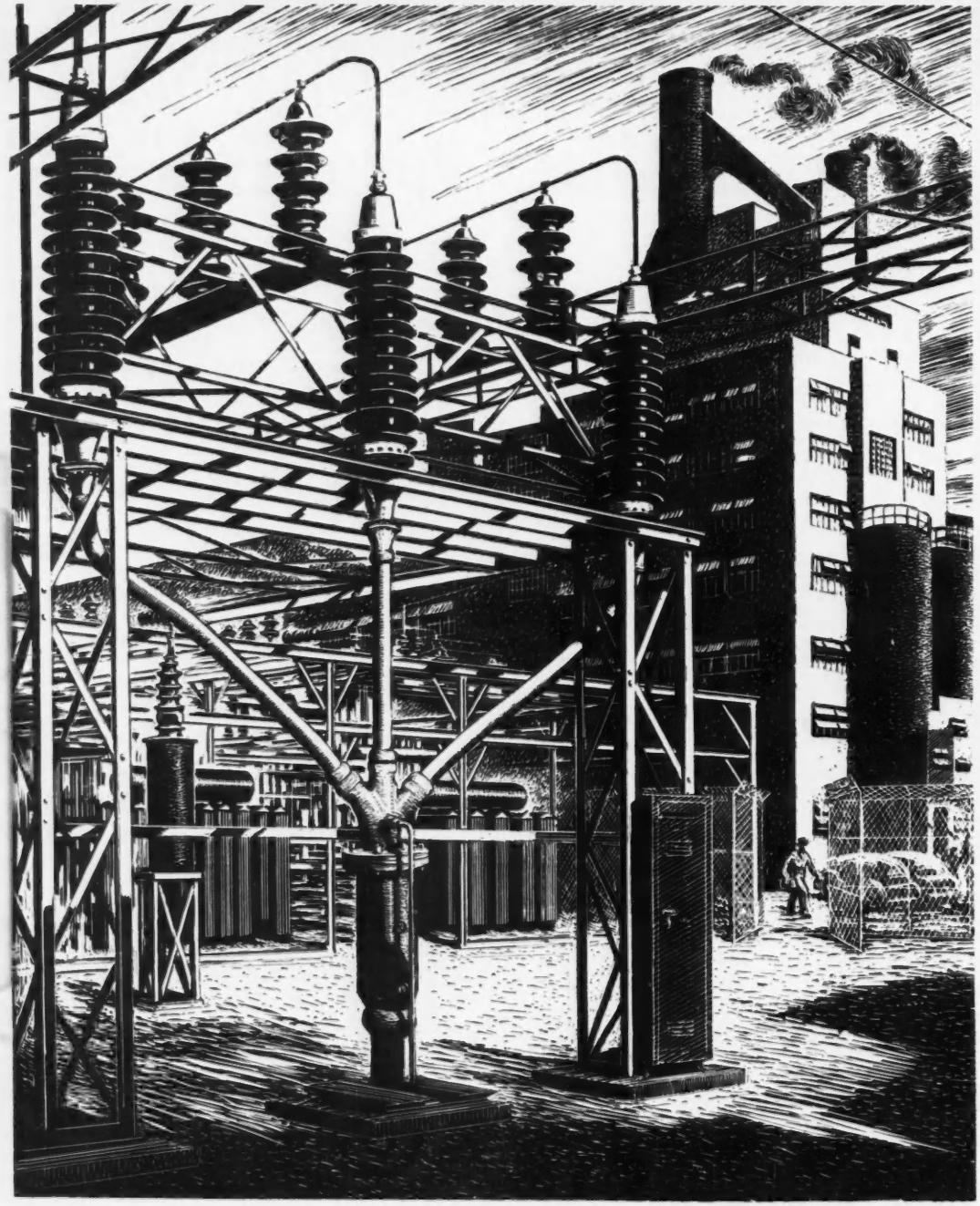
Let's not waste copper again . . . In the interest of real conservation the watthour meter manufacturers need the electric utility's help in securing adequate materials under CMP, so there can be no unmetered electric services.

ONLY MEASURED FACTS ARE KNOWN FACTS



SANGAMO ELECTRIC COMPANY

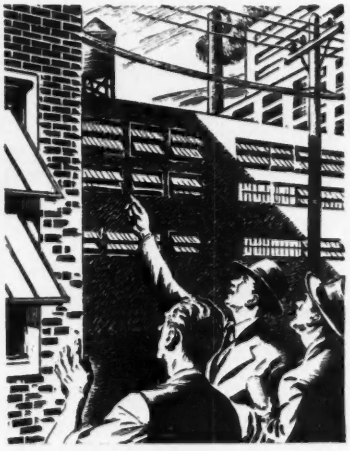
SPRINGFIELD, ILLINOIS



AT THE POWER STATION you see countless examples of General Electric's developments in the power field. Transformers, switchgear, turbines, motors—in fact all types of electrical equipment—are designed and built by General Electric. Developments like these help General Electric cable engineers understand the job cables have to do.

WIRE AND CABLE FOR ELECTRIC UTILITIES

How G-E experience can help solve your power problems



INTEGRATED EXPERIENCE

FREQUENT CONTACTS with utility men and their customers keep G-E engineers current on all types of applications. A free interchange of this information among all the various G-E divisions places General Electric cable engineers in a position to present a coordinated recommendation to any cable customer.

INSULATION RESEARCH
DESIGN ENGINEERING
LABORATORY TESTING
CONTROLLED MANUFACTURING
FIELD SERVICE

When you place an order for General Electric cable, you're ordering far more than just conductor and insulation. You're ordering the experience of G-E cable engineers—and the application of their knowledge and experience to solve your power problems.

At General Electric, cable is an integral part of the power picture. For, at G. E., cable engineers work closely with the engineers who build apparatus for every type of generation, distribution, and utilization application.

G-E engineers know the materials that go into cables—insulations, varnishes, and sheaths. They are familiar with equipment that works with cables—switchgear, turbines, transformers, motors, and a long line of electrical equipment. By utilizing this great pool of engineering information, G-E cable engineers can offer you cable that's built to help you solve your power problems.

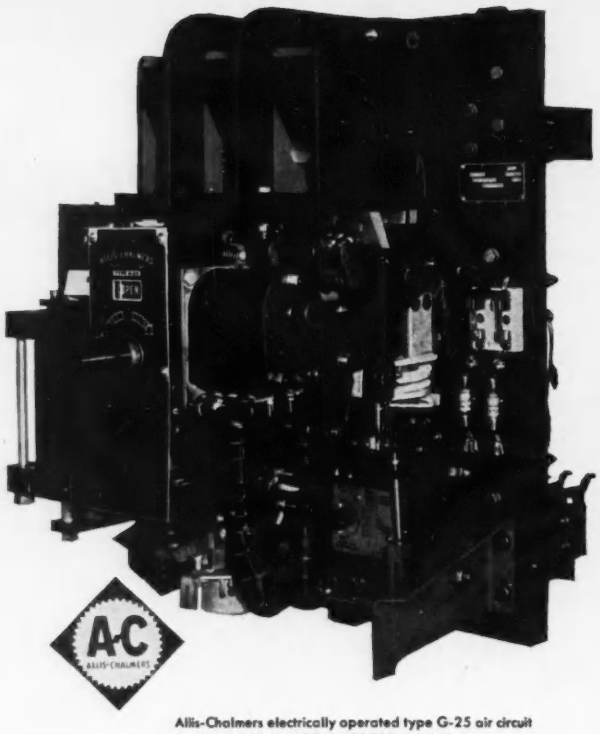
Whenever cable problems arise, call in your General Electric cable specialist. He can draw on the broad G-E background to supply you with the cable that meets your needs best. *Section W78-1227, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.*

You can put your confidence in—

GENERAL ELECTRIC

TOUGH DUTY FOR A MOUNTING PANEL

...why Allis-Chalmers mounts this G-25 Breaker on K&M EBONIZED ASBESTOS



Allis-Chalmers electrically operated type G-25 air circuit breaker; 600 V., 600 A., 25,000 A-I-C. Breaker components mounted on panel of K&M Ebonized Asbestos.

A 600 Amp. circuit breaker is heavy machinery—it has to be for dependable operation. To mount their popular G-25 Breaker, Allis-Chalmers uses K&M Ebonized Asbestos. Here are the reasons:

THE HIGH MECHANICAL STRENGTH of K&M Ebonized Asbestos withstands the structural forces of heavy breaker operations—helps assure that components will *stay put* through the busiest duty cycles.

EXCEPTIONAL DIELECTRIC STRENGTH effectively insulates operating components. And K&M Ebonized is completely non-magnetic—is not affected by electrical stresses.

RELATIVELY LIGHT IN WEIGHT, K&M Ebonized Asbestos can be handled easily; makes a mounting panel that is extremely strong without being unnecessarily heavy or bulky.

EASY TO CUT AND TO DRILL, Ebonized Asbestos saves fabrication time and costs; will not chip or fracture while being cut or drilled.

APPEARANCE THAT HELPS SELL! K&M Ebonized Asbestos is furnished with a smooth-sanded finish, lacquered with deep-black switchboard lacquer. This attractive, durable surface adds a sales "plus" to any unit!

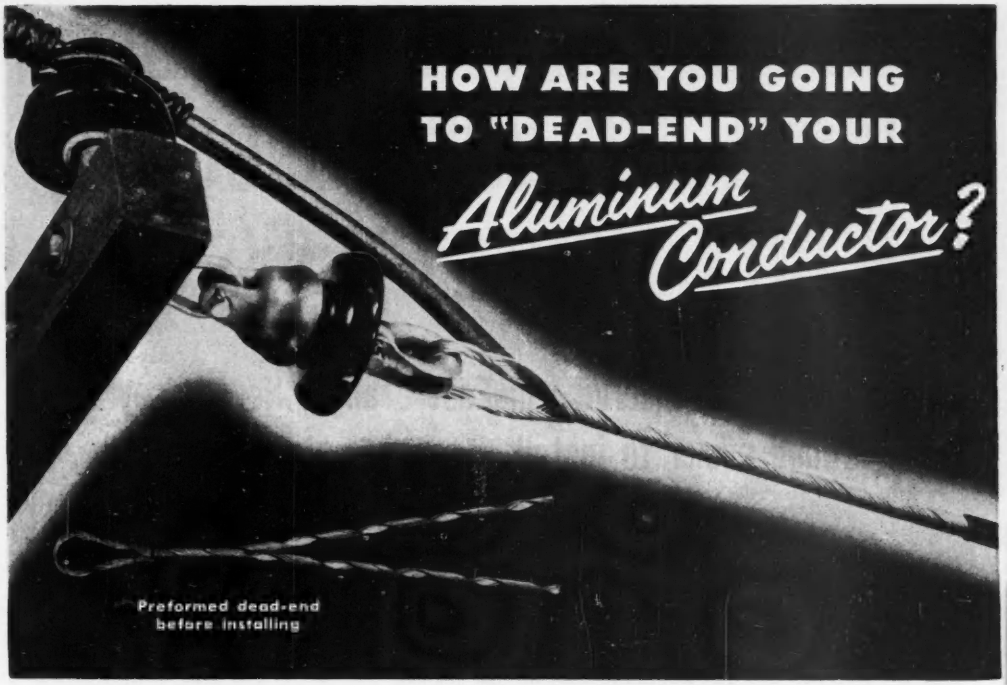
Allis-Chalmers is typical of the many progressive electrical equipment manufacturers who have found K&M Ebonized Asbestos the answer to their needs for panel mountings, test tables, bus bar supports, switchgear compartment linings, and many other applications. To find out how it can fill your needs, write us—without obligation, of course.

K&M best in asbestos ®

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

In Canada: ATLAS ASBESTOS CO., LTD., MONTREAL, TORONTO, WINNIPEG, VANCOUVER

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873



"Regarding the future, copper just will not be available. If you want to string lines, install buses, or run loops, it will pay you to investigate every possible use for aluminum wire—covered and bare."*

BUT DEAD-ENDING ALUMINUM CONDUCTORS EFFICIENTLY AND ECONOMICALLY TO ASSURE MAXIMUM LIFE REQUIRES A NEW TYPE OF DEAD-END.

Preformed Line Products Company shows the way again with the PREFORMED "ALUMINUM CONDUCTOR" DEAD-END pictured above.

For the details of its exclusive advantages write on your letterhead or . . .

TELEPHONE CLEVELAND: EXpress 1-3571

*From the remarks made by a spokesman of Defense Electric Power Administration before the Transmission and Distribution Committee of Edison Electric Institute at a recent meeting.

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

NEOPRENE-JACKETED CABLE INSTALLED UNDERGROUND IN CITY SIGNALING SYSTEM

New cable for service in East Orange, New Jersey found easier to install . . . resists deterioration by electrolytic action

1. Police, fire alarm and traffic cable is being replaced, as the occasion arises, with minimum service interruption in the busy city of East Orange, New Jersey. City electricians find neoprene-jacketed cable easy to install. And, unlike the lead-sheathed type it replaces, the neoprene-jacketed cable cannot become weakened by electrolytic action of stray currents from nearby power lines.

2. Neoprene doesn't corrode when submerged in water for long periods. To replace cable, this manhole had to be pumped free of water. It was found that breaks which occurred in lead-sheathed cable had exposed rubber insulation to steady soaking. Insulation was gummy . . . could be scraped off easily.

3. Because it resists abrasion and scuffing, neoprene-jacketed cable is less trouble to install. In this installation, it was simply fastened to a wire and pulled through ducts below the street. No special lubricants were required. As a result, this "pull" was completed in record time by members of the crew.

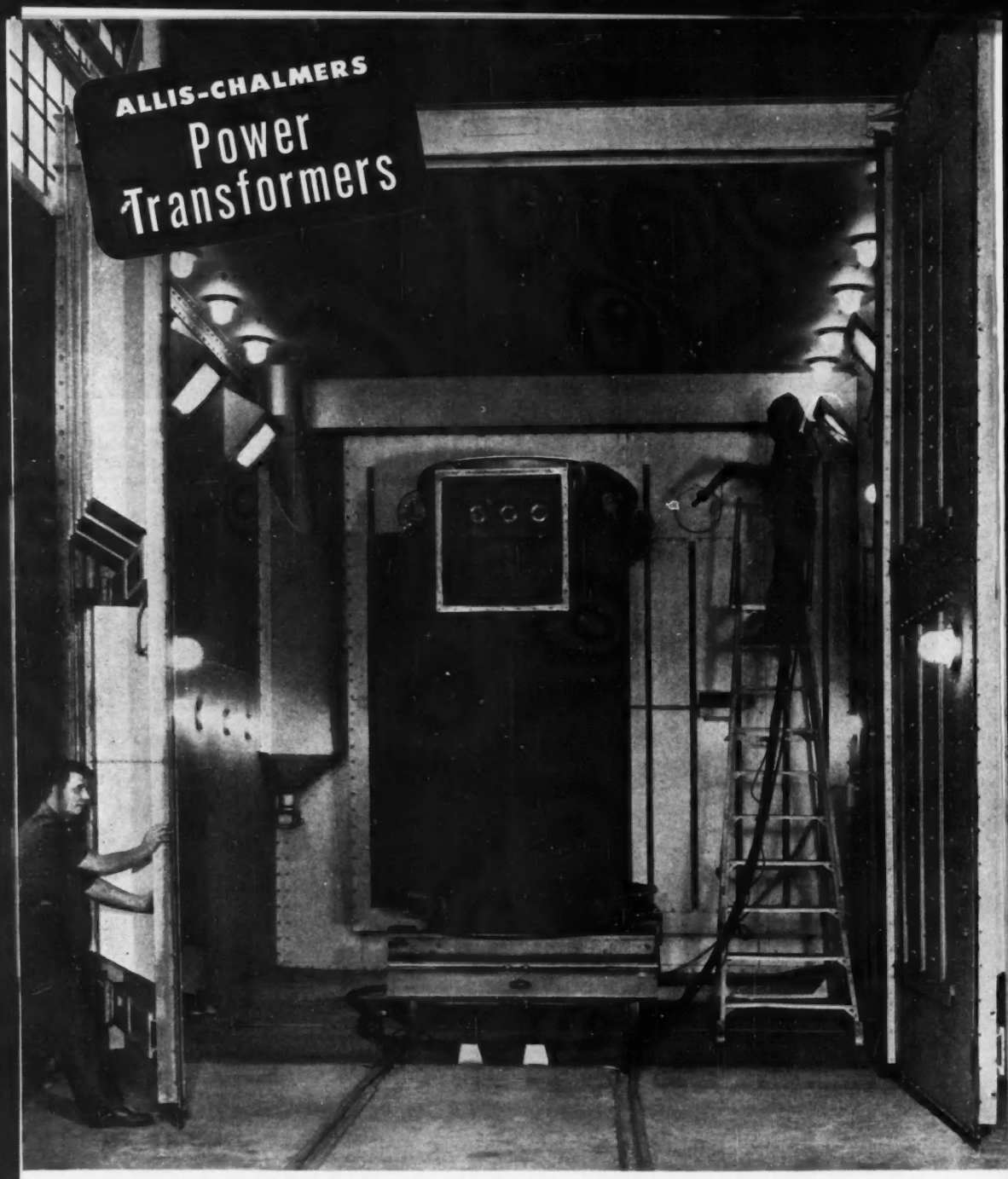
4. It's fast and easy to "pay off" neoprene-jacketed cable from reel. Neoprene-jacketed cable is lighter and more flexible than metal armored types. When installing lead covered cable, greater care must be exercised to prevent denting and scoring of the cover.

5. Proper tension is kept on wire when pull is started by using a truck equipped with winch. Actually neoprene-jacketed cable is so light and easy to handle, the crew members were able to pull this length manually with very little difficulty.

Your supplier will be glad to tell you more about neoprene-jacketed cables. These improved cables are now being used for a great variety of underground installations including highway, airport and street lighting. Cable with a jacket of neoprene can be buried directly in the ground since neoprene has superior resistance to galvanic action and soil acids.

Neoprene-jacketed cable is made in single and multiple conductor types, in voltage ratings to fit your requirements. New and interesting applications of neoprene are fully described in each issue of the Neoprene Notebook. Write today for your free subscription. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division G-12, Wilmington 98, Delaware.

NEOPRENE
The rubber made by Du Pont since 1932
DU PONT
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



CORROSION RESISTANT FINISH. Tanks are shot blasted in this booth to prepare their surfaces for painting. Three coats of paint provide a tough, corrosion-resistant finish. Radiators have a high quality protective coating that is the result of dip-Bonderizing and rotary flow painting.

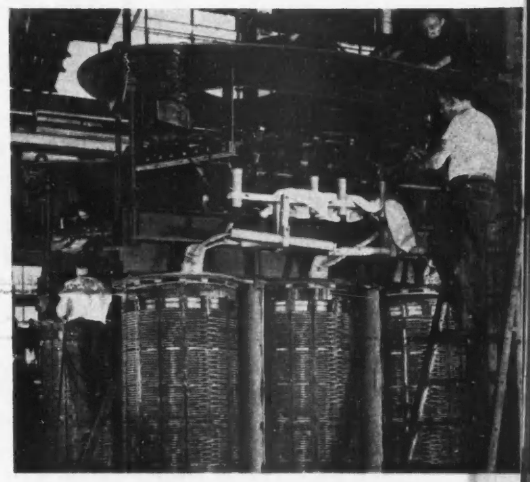
ALLIS-CHALMERS

OREGON UTILITY Boosts Capacity

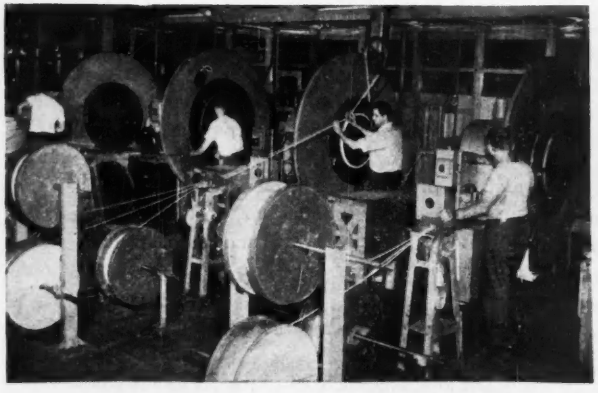
ADDS THREE 6,000 KVA ALLIS-CHALMERS POWER TRANSFORMERS

OREGON RESIDENTS use three times more power than the national average. Records show that 99% of the farms and suburban homes in the area served by the Portland General Electric Company are electrified. And Allis-Chalmers power, distribution and network transformers help PGE — the state's largest electric utility — distribute the power. These 6,000 kva transformers step up capacity for Salem, the capital city of Oregon.

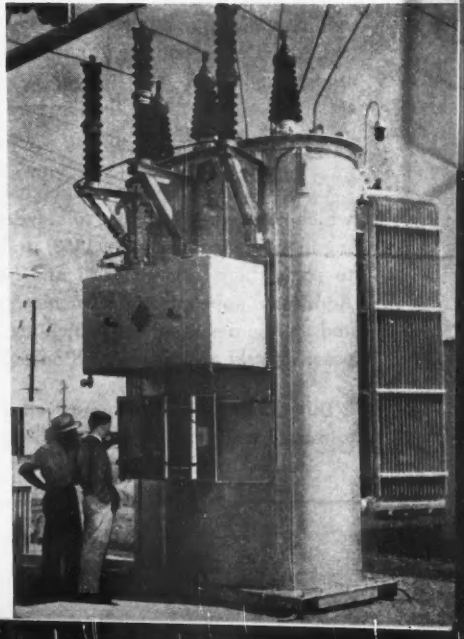
Repeat orders from PGE — and from utilities across the country — are evidence that Allis-Chalmers power transformers are providing dependable, on-the-job service day in and day out. For more details call in your A-C sales representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Offices in 64 principal cities. A-3542



GOOD WORKMANSHIP. Winding and core structure are securely supported and braced. Machine wound tubes, anchored in a sturdy clamping, support and insulate the leads. Good workmanship characterizes assembly work in all stages of transformer assembly.



WINDINGS ARE UNIFORMLY TIGHT. A battery of winding machines winds coils simultaneously from a continuous conductor. This method maintains uniform tightness throughout the winding process and eliminates internal connections. Spacers, uniformly spaced and cemented between coils, give good support and promote coolant circulation.



MORE POWER. This 6,000 kva transformer is one of three Allis-Chalmers power transformers installed at Portland General Electric Company's Middlegrove substation to boost power capacity.

Our Defense Program Faces a Crisis

A major crisis will soon confront our defense program.

It is not a crisis in raw materials. To find enough materials, from steel to cobalt, for defense production is a serious problem. But it is one that is being solved.

It is not a crisis in manpower. Shortages of workers with special skills hamper production, but these shortages are being relieved, slowly.

It is not a crisis in manufacturing capacity. American industry's record-breaking expansion is, with very few exceptions, keeping abreast of defense needs.

The coming crisis will be one of finance. It will rise from our failure to provide the means to PAY FOR the defense program we now have under way.

A $15 Billion Deficit?

Congress has approved a defense program which is scheduled to raise *total* federal spending in the year from June, 1952, to June, 1953, to somewhere between $85 and $90 billion. Additional appropriations for more air power and atomic development, which are now proposed, would add several billion dollars.

But Congress has not approved a tax plan to match such spending. With the new levies enacted in this session, tax collections during the 1952-53 fiscal year are estimated to fall somewhere between $70 and $75 billion. That would be roughly $15 billion short of balancing the budget. If the defense program is expanded, the deficit will be that much greater.

We have not yet felt the impact of the crisis that would accompany a federal deficit of this magnitude. Federal tax collections currently are big enough to balance federal expenditures. But the defense program is scheduled to boost the annual rate of federal expenditures $25 billion in the next year.

To Meet the Crisis

By January the crisis will be clearly in sight.

Then the President will present his budget. After that, Congress must act to close the broad gap between government income and government spending. If it fails to do that, the whole defense program will be menaced by weakness in its financial foundations. That weakness might well take the form of another destructive wave of inflation.

We have three ways to meet this crisis.

The best approach, of course, is to cut unessential expenditures. That can make a real dent in the deficit. The second is to collect more

taxes. The third, and by all odds the most dangerous, is to have the federal government meet its deficit by going deeper into debt. Borrowing, which might feed inflation, can easily lead to disaster.

Near Income Tax Limits

It will not be possible to raise taxes to meet the deficit merely by increasing further the rates on corporations and on persons in the upper income brackets. Congress has about scraped the bottom of that barrel.

The Senate Finance Committee said as much in reporting this year's tax bill. The Committee reported that it had "serious doubts as to the feasibility of raising any substantial additional amounts of revenue from income tax sources." The Committee observed that recent tax legislation brings the burdens of most corporate and individual income taxpayers close to the World War II peaks, and actually carries the rates paid by many taxpayers above those peaks.

Our ramshackle federal tax system must be thoroughly overhauled in order to broaden the tax base if it is to produce more revenue—without doing much more harm than good.

The shocking fact is that no one seems ready to act along any line that might enable us to surmount the crisis.

That fact of itself aggravates the coming crisis. And next year's presidential election doesn't make it any easier to move effectively. Both parties will shrink even more than normally from backing any program that might irritate any considerable number of voters.

If we are to meet this crisis on the tax front in an orderly way, the technical work should be in progress right now. To a large extent it is being ignored.

If we are to enforce the vitally essential program of government economy, there is the same urgent need to get under way the spade work that is required.

And if—as a last miserable expedient—we decide to let the federal government drift deeper into debt, it must have a well-developed program of borrowing from individuals and other investors, such as insurance companies, rather than from the commercial banks. Borrowing from commercial banks might speedily translate the deficit into more and more price inflation. No adequate program of borrowing from savings is now in sight.

Now Is the Time

It is possible, of course, that international relations may improve sufficiently to make it safe for us to slow down the rearmament program. If that should happen, the fiscal crisis would not be so critical. But that kind of good fortune has been notably absent in recent years.

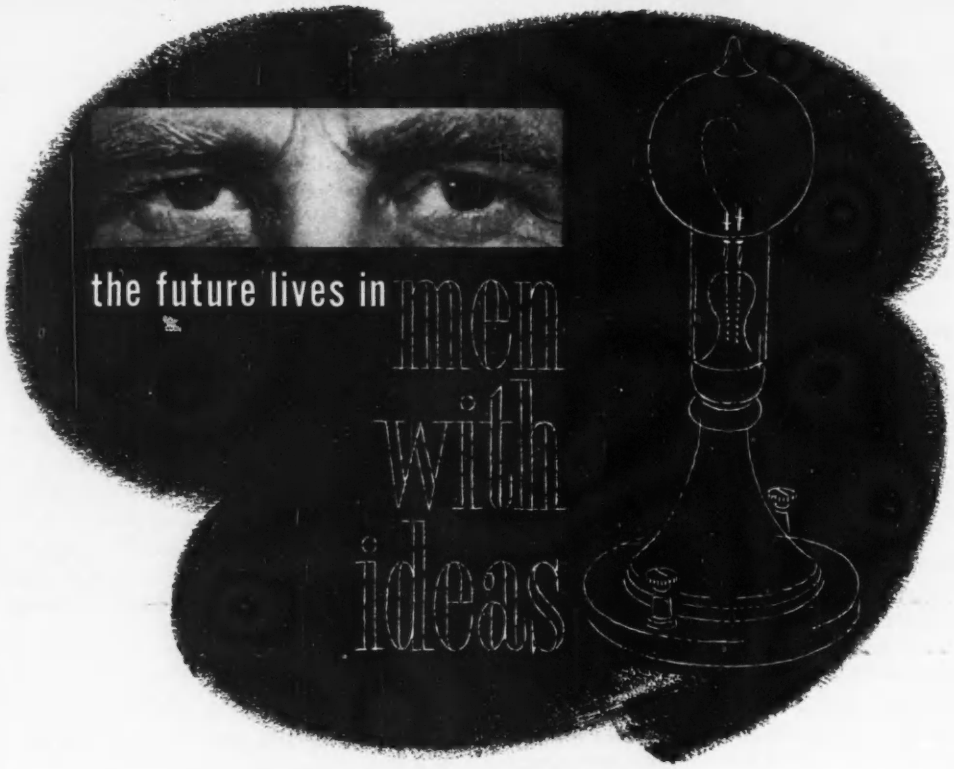
Lenin, patron saint of Communism, is quoted to the effect that to destroy a political and social system such as ours "you must debauch its money."

We shall set democracy to digging its own grave if, through our preoccupation with politics during the presidential campaign, we pave the way for further debauchery of our money.

If we really want to avert that disaster, now is the time for us to get going.

Once the crisis is full upon us, it will be too late.

McGraw-Hill Publishing Company, Inc.



The miracles of modern electric illumination were all foreshadowed by the glow of Edison's first lamp—implicit in the great IDEA. Also implied in this, as in all epoch-making inventions, were the corollary imagination and effort of thousands of unpublicized successors—pioneers of America's vital electric illuminating industry.

KERITE insulation was well established before the turn of the century. Already famous in telegraphic and signal applications, Kerite quickly won recognition for safety, dependability, and ultimate economy in the infant lighting and power industry . . . for the transmission of electric power via aerial, underground, and submarine cable.

By conscientious workmanship, careful handling, and a continuing search for new and better applications of its unique formula, The Kerite Company has been able to anticipate the power industry's needs. It will continue to apply itself to the technical world of "ideas" in which now, as in Edison's day, the future of America's power still lives.

KERITE CABLE

Kerite Insulation—Your Cable's Best Life Insurance

Editorials

The Challenge of Farm Electrification

In 1950 electricity use in agricultural production amounted to 0.164 kwhr per man-hour. In industry and commerce together, the ratio was 1.85 kwhr per man-hour, over 11 times greater. Farm production was 4.63% of the gross national product (exclusive of government operations). The electricity used in farm production was only 1.41% of the total amount used in national production. In relation to value of product, farming uses less than a third as much electricity as does the whole national economy.

Data for these ratios come from the study of the farm market reported in this issue of Electrical World, from EEI statistics, and from a paper presented to a "Conference on Research in Income and Wealth" last May by John W. Kendrick, U. S. Department of Commerce.

It is a disturbing bit of knowledge, the fact that in this country, the most highly electrified in the world, farm production makes such comparatively small use of electricity. It is undoubtedly a considerable part of the reason why, according to Mr. Kendrick, product value per man-hour in farming is 36c as against $1.32 for non-farm production.

The ratios presented above do not constitute a fair comparison. Their usefulness lies in their indication of the situation and in their value as a spur towards improvement of it. They are unfair because they do not disclose the many good reasons why farm use of electricity lags.

Farming is a widely dispersed industry. It exists mostly in small units. With only a few exceptions, it includes no large concentrations of production requiring correspondingly large amounts of electricity, like the factories, mills, mines, shops, and offices of industry and commerce. The machine on the farm works only part time, once or twice a day, perhaps only a few days per year, very different from the day-in day-out work of the machine in industry. Farming operations depend on the smiles and frowns of Mother Nature, cannot be organized and scheduled like factory production. Farming is less an industry than a way of life; it is usually a family affair. As such it is less subject, and less responsive, to the pressures and compulsions towards efficiency that are an unquestioned condition in industry.

These, and many other good reasons that could be cited, explain why farming has not kept up with industry and commerce in putting electricity to work. But the fact of good reason why something has not been done in the past is not, of itself, good reason why that something cannot be done in the future. The ratios presented in the opening paragraph of this editorial shout a challenge. They challenge farmers to take a more receptive attitude towards modern production methods. And, most insistently, they challenge suppliers of electricity and manufacturers of electrical goods to sell their service and their products in a market that, as yet, has not had the intensive cultivation it needs.

Public Power Shudders as PUD Sinks

Financial as well as utility circles should watch with more than casual interest eleventh-hour attempts of public power interests in the Pacific Northwest to stem mounting deficits and possible bankruptcy of the Northern Wasco PUD. When a lawyer working with the PUD said that default on its bonds would "retard growth of PUD's elsewhere by making bonding houses reluctant to handle public power bond issues," he wasn't just kidding. Arguments on the ideology of private enterprise are one thing; operating deficits and possible default on bonds are quite another.

Basic trouble with the PUD operation seems to be quite simple. It hasn't been able to sell its services to enough of the customers of competing Pacific Power & Light Co to put its operation on a paying basis. Operations are currently showing a monthly deficit of $1,000 and an unpaid power bill of $18,000 is owed its supplier, Bonneville. In an attempt to cut down the deficit, the PUD has dispensed with the services of its own manager and hired the parttime services of the manager of the local REA cooperative.

This distasteful surrender of autonomy may alleviate the present desperate situation, but holders of the district's revenue bonds will rightfully be wondering what the future holds. First payments on the principal of the loans are due to start in 1952, and the new manager will have to accomplish a minor miracle to put the district back on its feet in time to meet these obligations.

Let's Research Conductivity

Copper will be in short supply during the present emergency, and depleting deposits may intensify the stringency even if war does not come or really threaten. The old saying, "What can we use for money?" will have become, "What will we use for copper?" The answer electrically is already aluminum, but it is not a 100% happy answer for equipment windings, insulated cables, etc, simply because aluminum involves more cross section for the same conductive capability.

It does but *must* it do so? Must it be accepted so sacredly that nothing much can be done to change metallic conductivities except in the wrong direction?

Organic chemists have learned how to dragoon molecules into stable chains that constitute a whole new world of resins and plastics. Metallurgists first alloyed nickel and cobalt into iron to achieve phenomenal enhancement of the magnetic properties. Later they marshalled the iron molecules into oriented alignments that gave the iron other greatly improved magnetic properties. Illumination was given a boost by pairing fluorescence with incandescence. The list is endless.

But one never sees reports of aggressive research directed at comparable revamping of atomic or molecular configurations to achieve bettered conductivity. The one exception is the resort to artificially low temperatures but that is hardly a practicable matter. Of course, the discoveries here may in the end give a clue to practicabilities.

The almost complete absence of research can only be interpreted as an indication of complacent acceptance of the idea that conductivities of electrical conductors are preordained and inviolate. This carries with it the notion that research would be inescapably futile and therefore unjustified.

No one dares say that is not actually the case. But the millions of tons of copper and aluminum already committed to service on electric systems, in industry, and in the home make the goal an economically alluring one. Even ten or as little as five per cent betterment of conductivity would ease the tonnage requirements and prolong the life of the mineral reserves. It would take much more than those modest percentages to let aluminum slip into the same equipment patterns now conductored with copper. A medal or a monument awaits the scientist who will contribute the first significant slash into the snug fortress that conductivity has been permitted to become.

Prize Awards Again

What makes people enter competitions? The hope of winning.

What keeps people out of them? Two causes—the fear of losing is one; laziness is the other.

Editorially, we cannot admit that laziness may be in any case a reason why the number of entries in the prize award competitions administered by the Edison Electric Institute is not larger. We must leave such admission to the consciences of those who do not enter.

We are thus forced to conclude that fear of losing is what holds back so many power companies from competing for these awards. And we don't like this idea, either. It does not jibe with our official belief in respect to power company sales departments—that they are all enterprising, promotion-minded, and alert.

If there were only one competition with only one award, it would be easier to understand why only a few tried for it—those who believed themselves super-qualified in that particular field. But there are six competitions in the commercial field, and they include 32 awards. The chance of bagging a prize is directly in proportion to the number of them. There are prizes to fit all sizes, shapes, and conditions of power company commercial operations.

If every power company in the country—all are eligible whether members of EEI or not—entered all six of the award competitions in the commercial field, the EEI would be flooded with about 2,000 entries. The judges would have a tough time digging themselves out. As it is, the judges are not overburdened. Last year there were more entries than ever before, but still less than 10% of the possible number. Must that minus 10% be taken as a measure of the commercial enterprise and accomplishment of the power companies? We'd hate to think so.

The Electrical Week

INDUSTRY MOBILIZATION (page 99)—White-collar workers get a break under new SSB order. They can get pay increases denied them since last August . . . Directory of NPA's Copper Division lists officials . . . Industry M orders listed.

WASHINGTON—Do water rights granted by a state "evaporate" when Federal Power Commission authorizes use of the water for a federally licensed project? This will be decided by U. S. Court of Appeals (p 92) . . . Reclamation extends its Missouri Basin markets (p 92).

ELSEWHERE—EEI power survey indicates a 7.8% reserve during the December peak (p 90) . . . Part II of article on EEI committee activities for 1952 is presented on page 93.

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Washington—NPA's electrical equipment division receives supplemental allotments of copper wire mill products, aluminum, and steel to add to its first quarter quotas. However, Depa's request for more structural steel for the first quarter has been turned down . . . Guy T. Shoemaker, retired vice president of Kansas City P & L, joins Depa's major equipment scheduling branch . . . REA approves supplemental loans for generating and transmission construction to Northern Michigan Electric Cooperative for $1,406,000 and to Central Power Cooperative in Missouri for $2,538,000 . . . DPA is considering giving extra steel allotments to firms which can secure imported steel.

During the Civil Defense A-bomb drill in New York City on Nov. 28, the load of Consolidated Edison in the four boroughs (excluding Richmond) and Westchester dropped nearly 20% from 2,340,000 kw to 1,890,000 kw in eight minutes. The load was recovered in 8 minutes after the all clear signal.

Net increase in central station capacity in October was only 374,919 kw. Total U. S. is now 74,691,725 kw.

Electric Companies Public Information Program (PIP) has approved plans for a national observance of "Production for Power Week" for 1952.

Rates—Duke Power Co asks North Carolina PUC and South Carolina PSC for estimated $3 million annual increase . . . Wisconsin PSC orders a hearing on Dec. 10 for the Wisconsin EP to investigate "the rates, rules, charges, and operations."

In the November issue of "The Exchange," published by the New York Stock Exchange, Pres Philip Sporn, American Gas & Electric Co, writes "Investors Register Confidence in Utilities." Sporn shows that $870 million in electric utility common stocks was sold from 1945 through 1950 and that this financing has been vital to the industry's multi-billion dollar expansion program. To carry out the further expansion needed to meet this country's twin objective of arming against any aggressor and maintaining the civilian economy, Sporn points out that there are four essentials for "the publicly owned utilities," as he refers to the private companies: (1) Capital funds to carry the expansion program, (2) broad gauge planning for full opportunity to grow and expand, (3) research and imagination, and (4) enterprise which supplies the drive and vitality necessary for outstanding achievement.

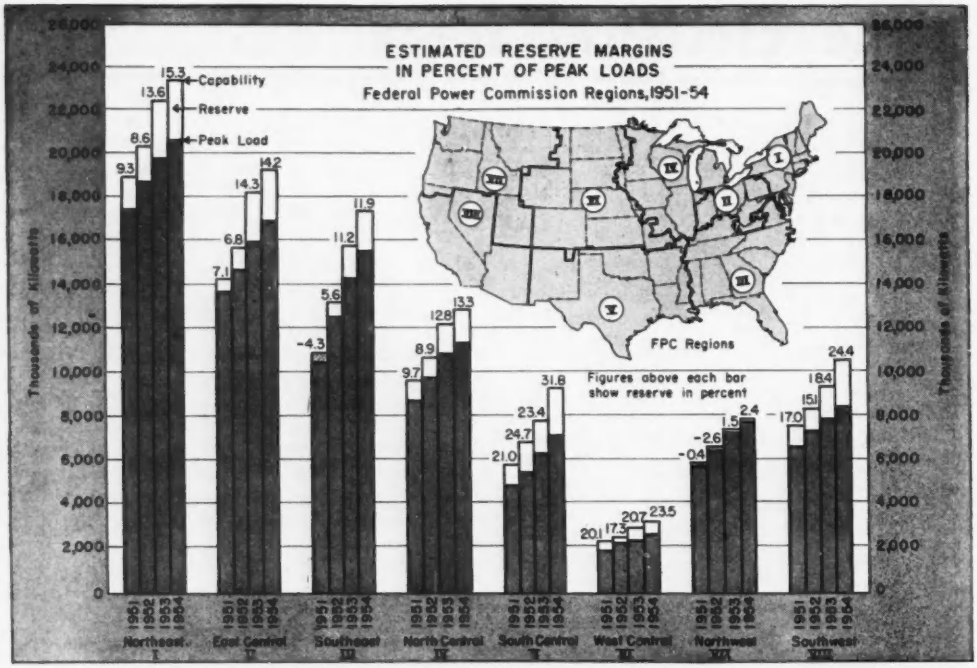
To finance its $296-million expansion program, Westinghouse Electric Corp arranges to place $250 million, as needed, 3½% 30-year debentures due Dec. 15, 1981, with institutions, Pres Gwilym A. Price announces. It has taken an option for another $50 million from the same investors.

Financing—Central Republic Co, Blyth & Co, Merrill Lynch group announces a continuation of the offering of Northern Indiana PS 4.56% preference stock at $24 . . . Maine PS declares 30¢ per share common dividend payable Jan. 2 to record Dec. 14 compared with 25¢ previous quarters.

Power won over fish last week as the FPC granted a license to the City of Tacoma to build its project on the Cowlitz River, thus overruling its examiner.

From New England—Public Service Co of New Hampshire gets FPC approval to increase rates to Central Vermont PS by about $40,800 a year but suspends a second increase of $10,400 annually . . . Western Massachusetts Electric Pres Howard J. Cadwell plans $27 million construction program, including 60,000 kw steam plant at site as yet unannounced . . . New England electric utilities have financed 72 new generating units since 1940, with new construction totaling $500 million.

Congratulations—Glenn B. Warren, general manager, Turbine Divisions, General Electric Co, Schenectady, N. Y., gets ASME Medal, highest award of The American Society of Mechanical Engineers, for "leadership in the science and art of turbine design."



REGIONAL RESERVES of generating capability will be adequate in most areas, tight in two, if hydro conditions are median

Capability Reserve Set at 7.8% in '51

EEI Survey Reveals Industry Is Ready to Carry Peak Week Load; Only 2 Areas May Have Trouble; Materials Lack Threat to Future

Just two weeks away is the industry's big week of 1951. This week, that commencing Dec. 13, is expected to be the week of greatest output and highest peak loads. Will the industry have enough capability to satisfy the demand of its customers?

The answer supplied by Edison Electric Institute's tenth semi-annual power survey is yes, but not by much. The three score of experts who assembled the data and interpreted it predict that capability will be 74,925,000 kw, peak load will reach 69,498,000 kw, and gross margin will be 5,427,000 kw or 7.8%. These are figures for the entire United States. Two regions show small deficits.

Further disquieting is a note in the survey report reading:

"FPC data for December 1950 for the country as a whole show that 'Reported Required Reserves' were 7.3% of dependable capacity. On the basis of this percentage the Required Reserves would be about 5.5 million kw for 1951."

This indicates that all of the nation's reserve will be needed to cover maintenance, emergency outages, and system operating requirements.

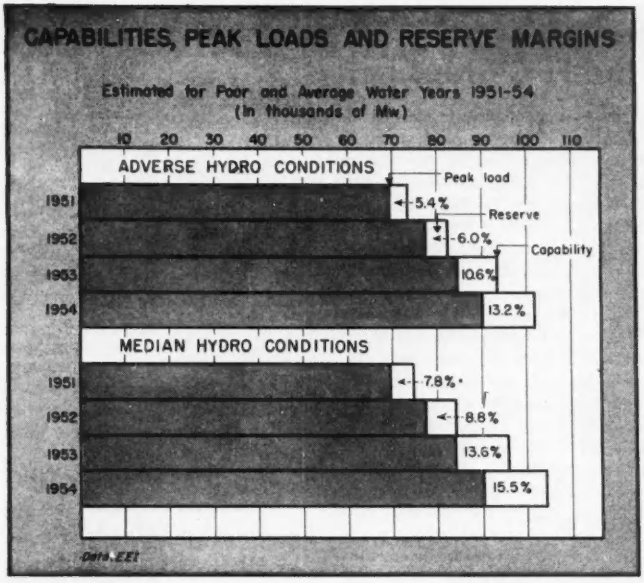
The good news is that if the industry gets by this month as the experts believe it will, the industry will be safe for another year. Peak loads customarily start declining in January and continue falling until April or May. They do not equal those of the previous December until September or October . In the meantime capability has been increased by new units.

The 7.8% margin for 1951 is predicated on median hydro conditions. Indications are that such conditions prevail this year. Past experience has been that adverse conditions never occur in all areas at the same time. If they do this year the margin will be only 5.4%. The regions that would be hit hardest are the Northwest (FPC Region VII) and the Southeast (Region III).

These are the two regions which show deficits even under median hydro conditions. The Northwest is lacking 0.4%, the Southeast 4.3%. Both will probably squeeze through.

Forecasts now are that this is the last bad year for the Southeast. By 1952 its margin should be 5.6%, going to 11.2% in 1953. The Northwest is down for a bigger deficit in 1952, one of 2.6%. In 1953 the margin is expected to be 1.5%. In 1950 it was 1.8%.

The survey indicated that the gravest



NATIONAL TOTALS show growing reserves under poor or median water conditions

concern of the industry is now slippage. This is the delay of manufacturers in shipping all the equipment needed for new power plants. Delay in shipping even the smallest item of auxiliary equipment can keep a station off the line. As of Oct. 1 slippage for this year was 320,000 kw. This is a trivial amount as in this period 4,074,200 kw of generators in sizes 4,000 kw or larger were shipped. Shipments scheduled for this year total 6,112,500 kw. Most of this will be shipped but naturally not all shipped can be installed.

At present manufacturers have scheduled for shipment in 1952 10,421,500 kw of generators 4,000 kw in capacity or larger. The total for 1953 is 11,064,900 kw. With material allotments as short as they have been in the last quarter of 1951 and as they are likely to be in the first half of 1952 and perhaps longer, manufacturers can't produce and ship these amounts.

A similar condition exists with respect to other apparatus. Shipping schedules for the coming years are higher than can be met unless the supply of materials increases rapidly.

The result will be that the reserve margins indicated in the survey for 1952 and 1953 are a bit too high. But even with these margins slightly reduced the industry should still be able to get by in both years.

Energy Output and Percentage Increase 1950-1954

(Millions of Kilowatt Hours)

FPC Regions	1950*	1951**	% Inc.	1952	% Inc.	1953	% Inc.	1954	% Inc.
I Northeast	79,441	88,908	11.9	97,172	9.3	108,506	5.5	107,093	4.5
II East Central	65,584	73,611	12.2	82,021	11.4	91,221	11.2	95,628	4.8
III Southeast	48,825	56,525	15.8	66,534	17.7	77,409	16.3	85,475	10.4
IV North Central	40,115	44,458	10.8	49,312	10.9	55,745	13.0	59,167	6.1
V South Central	23,018	28,325	23.1	32,937	16.3	38,676	17.4	43,863	13.4
VI West Central	7,976	9,528	19.5	10,668	12.0	11,676	9.4	12,675	8.6
VII Northwest	29,939	34,053	13.7	38,898	14.2	43,975	13.1	46,168	5.0
East Division	5,376	5,945	10.6	6,557	10.3	7,207	9.9	7,634	5.9
West Division	24,563	28,108	14.4	32,341	15.1	36,768	13.7	38,534	4.8
VIII Southwest	31,493	35,272	12.0	39,921	13.2	43,359	8.6	46,385	7.0
TOTAL UNITED STATES	326,391	370,680	13.6	417,463	12.6	464,567	11.3	496,454	6.9

* Figures for 1950 represent actual operating data.
** Data for 1951 and beyond are based upon scheduled increases in capability.

Wash Developed to Rid Surfaces of Radioactivity

A wash designed to rid surfaces of bomb-deposited radioactivity has been developed by Jack De Ment, head of De Ment Laboratories, Portland, Ore.

The 31-year-old chemist, under contract to the Atomic Energy Commission, completed his experiments on the formula in 1947 but kept it secret until his patent, now assigned to AEC, had been granted. The commission made the formula available on a royalty-free basis.

Intended for use on metal, wood or other hard surfaces which have been contaminated by radioactivity, the solution of water and silicon tetrachloride attaches itself to radioactive atoms, forming a gelatinous solid which can be washed from the surfaces.

The silicon tetrachloride hydrolizes in the presence of water, releasing hydrochloric and silicic acids and at the same time entrapping and absorbing the contaminates. One problem not yet solved is disposal of the wash after it is filled with radioactive particles, since dumping it into sewers or streams would contaminate other areas.

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Detroit Edison to Install 2nd Radio Relay System

Detroit Edison Co has contracted with Federal Telephone & Radio Corp, Clifton, N. J., to install a pulse-time-modulation radio relay system for communication between its main office in Detroit and a power station under construction 42 miles away.

The 2,000 Mc, eight-channel system consists of two terminals and a repeater station designed for unattended operation. The company has just completed a year's operation with a Federal PTM system equipped to operate on four channels for dispatch of power-control information between headquarters and a plant 17 miles distant.

To Construct New Plant

Nantahala Power & Light Co, Franklin, N. C., has announced plans to build a $2.7 million hydroelectric generating plant on the Tuckaseegee River in Jackson County, N. C.

Do Water Rights Granted by State 'Evaporate' When the FPC Steps In?

Do the water power rights granted by a state "evaporate" when the Federal Power Commission authorizes use of the water for a federally licensed project?

This question was put to the U. S. Court of Appeals for the District of Columbia last week by Niagara Mohawk Power Corp and FPC. It will receive a judicial answer when the decision is handed down, unless the court decides the case on a side issue.

On a broader scale, the case is a further test of the authority of the Federal Power Act as it relates to states' rights.

John W. Davis, widely-known lawyer and one-time Democratic candidate for President, argued the case for Niagara Mohawk. Willard W. Gatchell, assistant general counsel for FPC, argued the case for the commission.

Niagara Mohawk sought a court review of the FPC order disallowing the inclusion of payments for water power rights by the company in figuring the amortization reserve account of its hydroelectric project on the Niagara River. The period in question was from March 1941, to December 1946, and the amount, $798,000, half of which Niagara Mohawk contended should be figured in the amortization reserve account.

The rights, said the company, were held by International Paper Co and Buffalo Niagara Electric Corp. Niagara Mohawk had paid for the water rights and used the water in connection with one of its hydroelectric projects, which had been licensed by FPC in 1921.

The rights, the company argued, had been granted by the State of New York and had previously been recognized as valid by both the commission and courts. The Federal Power Act, Niagara Mohawk argued, did not destroy the rights.

The commission's attorney admitted FPC had, in originally granting the license, seemingly recognized the validity of one of the water rights in question. But, he argued, the commission had erred at the time, and later court action does not permit FPC to continue the error.

After securing the federal license, FPC argued, Niagara was not under any necessity of securing similar rights under state law to use the water of this navigable stream.

But even if the water rights were valid under state law, FPC argued, they had no assessable value and could not be compensated for under the Federal Power Act.

Further, said FPC, since the commission first disallowed compensation for these rights in 1947, Niagara Mohawk is not within the statutory time limitation in seeking court review.

J. HAROLD DAWSON, assistant to chief generation engineer of the Northeastern Division, British Electricity, was one of 35 scientists and engineers recently awarded a year of graduate study of U. S. technology under the ECA program. He is shown working in the welding laboratory of Rensselaer Polytechnic Institute

Reclamation Extends Its Missouri Basin Markets

The power marketing area for Bureau of Reclamation's Missouri River Basin projects has been extended as a result of funds being made available for construction of two additional dams and power plants.

Abandonment of the former geographical limitations was made possible by funds for the construction of Gavins Point and Oahe Power Plants, which will make an additional capacity of 525,000 kw available in the area.

Formerly the area had been restricted to a radius of 150 miles from Fort Randall Dam and 275 miles from Garrison Dam. Interior Department announced removal of the limitation will make it possible to market federal power in southern and western Minnesota, western Iowa and Nebraska, as well as North and South Dakota, which lay in the former marketing area.

Brazil Has Power Shortage

A critical power shortage, brought on by drought conditions, may force the Brazilian government to cut the work week in factories to three days to conserve electricity. The government also is planning to have commercial establishments open earlier and close before sundown. Power to more than 2,000 customers has been cut off because they exceeded their quotas.

EEI: Its Research Projects Are Multiple

Part II of a Two-Part Article

M. E. SKINNER

R. J. MILLER

R. W. WILSON

S. S. SANSBURY

R. I. BULL

A large segment of the electrical industry looks to the working committees of Edison Electric Institute for information and guidance on how to meet its problems. On Nov. 12 Electrical World presented a resume of the projects EEI's Engineering and General Committees will be working on in the coming year. The institute's Commercial and Accounting Divisions also have scheduled a heavy program for 1952.

The program is outlined here so utilities may draw on the work of groups considering subjects of interest to them.

Commercial Division Committees

Motivating force behind the work of the Commercial Committees, according to EEI, is the conviction that electricity is increasingly vital to the homes, farms and industries of the United States.

Electricity, division leaders point out, has become essential to the efficient performance of countless tasks. Its use steps up productivity by conserving labor, time and materials.

For these reasons, the division during the coming year will stress power applications that contribute to national productivity.

Commercial Division General . . . Coordinates and approves plans of 17 committees in the division. This year the committee, headed by Merrill E. Skinner, Union Electric Co of Missouri, will have two subcommittees: Codes and Standards and Residential Heating, and a Task Committee on Allocations of Materials.

Sales Personnel and Training . . . Plans to draw up three new Basic Sales Training Courses on floor prospecting, floor product demonstrations, and closing the sale. Under R. J. Miller, Cleveland Electric Illuminating Co, the committee also will prepare two promotion booklets, one dealing with major kitchen appliances and the other with laundry equipment and electric water heaters.

J. D. HOWARD

R. M. HOOT

B. S. MOSS

E. D. SMITH

A. G. MAYER

Wiring and Specifications . . . Will revise its manual on Electric Water Heaters, adding a section on small appliances. The committee, headed by R. W. Wilson of Kentucky Utilities Co, also will issue two manuals it has completed on laundry and electric range wiring installation procedures.

Commercial Sales Section

Commercial Cooking . . . Plans to issue pocket-sized reference book for use by commercial cooking salesmen in answering questions of restaurant operators. Will sponsor the annual Commercial Cooking Conference at the time of the National Restaurant Show in Chicago. The committee is headed by S. S. Sansbury, Union Electric Co of Missouri.

Commercial Lighting . . . Will study effectiveness of Planned Lighting materials designed for use in the commercial market to determine whether additions or revisions are necessary. Under R. I. Bull of Ohio Power Co, the group will also investigate the sales potential of signs and outdoor advertising and continue work on a new manual describing the operation of commercial lighting departments.

Market Development and Electrical Applications . . . Plans to issue three reports during the year on load and revenue studies. One of them is a research project on the various components that make up the store lighting load. The committee, under J. D. Howard, Wisconsin Power & Light Co, also will draw up a commercial sales reference book.

Street Lighting Coordination . . . Will complete and publish bi-annual Street Lighting Report on practices and trends. Chairman of the committee is R. M. Hoot, Philadelphia Electric Co.

Commercial, Accounting Committees

EEI Projects, continued

W. P. LYMAN

G. S. YOUNG

R. W. WYMAN

M. R. NORTON

W. T. CLARK

Farm Section

Agricultural Development . . . Plans a report on the types of agricultural development programs being conducted by companies the committee members represent. Will cooperate with the two other committees in the section in publishing Farm Electrification News, in which changes are being made. B. S. Moss, Georgia Power Co, is committee chairman.

Farm Utilization . . . Intends to prepare two slide film kits, the first on farm equipment and its maintenance and the second on safe practices in the use of electric service. In addition, the group, headed by E. D. Smith, Dayton Power & Light Co, will revise and add to farm publications prepared earlier.

Rural Youth . . . Is drawing up, under Chairman A. G. Mayer, Washington Water Power Co, a report on vocational agricultural programs within the industry.

Industrial Section

Industrial Power and Heating Section . . . Will organize, through its three committees, the Industrial Electrification Council. The council's purpose will be to advance the use of electricity in industry. Committees of the section and their chairmen are: Competitive Service, W. P. Lyman, Carolina Power & Light Co; General Power and Heating, G. S. Young, Kansas City Power & Light Co; and Industrial Lighting, R. W. Wyman, Cleveland Electric Illuminating.

Residential Section

Dealer Coordination . . . Will continue to sponsor dealer-utility workshops, and is planning to prepare a written review for distribution to the industry. M. R. Norton, Wisconsin Power & Light Co, is committee chairman.

Electric Kitchen and Laundry . . . Plans to put out new promotion stressing electrical living, using present-day appliances. The "package" will include a 16 mm sound film. Chairman W. T. Clark, Cleveland Electric Illuminating, heads the group.

J. R. BRODERICK

ELIZ. WILLIAMS

J. M. STEDMAN

T. G. ALLAN

G. L. LAHODNY

Electric Water Heating . . . Is continuing work on a heater manual for salesmen as part of program to promote use of automatic water heater systems. The committee, headed by J. R. Broderick, Central Illinois Public Service Corp, is conducting a study on the effect of high wattage elements on utility distribution systems.

Home Service . . . Will spend most of its time developing an energy-saving program for the handicapped housewife. Chairman Elizabeth Williams, Monongahela Power Co, also plans to have the committee develop a cook book designed expressly for use by new cooks.

Merchandising . . . Will be responsible for the study of merchandise sales policies of member companies. It will consider their relations with manufacturers, distributors, and dealers; cooperation with promotional and selling programs of other commercial enterprises; and employee purchase programs. A new committee, it is directed by J. M. Stedman, Pennsylvania Power & Light Co.

Residential Lighting . . . Will publish "Planning Your Home in Better Light," a consumer booklet, and an "Idea Book" on lighting promotions. T. G. Allan, West Penn Power Co, is the committee's chairman.

Television . . . Proposes to publish a television newsletter containing items on TV development of interest to utility personnel. Under George L. Lahodny, Detroit Edison Co, the committee will also continue studying the effect of television receivers on residential load and TV commercials as part of utility advertising.

# of EEI Schedule Heavy '52 Program

R. H. SMITH

H. H. SCAFF

M. J. WALSH

F. J. FLOM

E. G. PRENTICE

Accounting Division

Many of the accounting projects scheduled for study and report will be completed in time for the joint spring conference of electric and gas utility accountants, held with the American Gas Association. A number of long-term projects are also in the works, the results of which will not be apparent this year.

Accounting committeemen, according to EEI, continually try to increase efficiency of utility operations through studies of the best use of money, methods, manpower and materials.

(Accounting Division projects, unless noted, are undertaken jointly with corresponding committees of American Gas Association.)

Executive . . . Guides other committees of the division in drawing up their program. Subcommittees that will be most active this year are: Uniform System of Accounts, Accounting Employee Relations, Accounting Developments Service, Electronic Accounting Machine Developments, and Cost Control. R. H. Smith, Cleveland Electric Illuminating, is chairman.

Applications of Accounting Principles . . . Will continue to promote understanding on the applications of new developments in accounting principles. The committee, one of the few without an equivalent in the AGA Accounting Section, is under H. H. Scaff, Ebasco Services, Inc.

Customer Activities Group

Customer Accounting . . . Plans to present a two-part paper on "Improved Meter Reading Efficiency", and begin two new long-range projects: "Customer Accounting Methods and Equipment", and "Filing Methods and Equipment." Chairman is M. J. Walsh, Consolidated Edison Co.

Customer Collections . . . Has scheduled a new long-range project, "Should Collectors Be Added to Reduce the Uncollectible Loss?" At its Spring Conference, the committee, headed by F. J. Flom, Detroit Edison Co, will reopen the 1949 project, "Let's Look at Mr. B. D.," under the new title, "Determination of Collection Policy."

G. T. LOGAN

H. W. BOOZER

W. T. HAMILTON

E. D. KING

L. F. SCHOLLEY

Customer Relations . . . Will continue, through a series of short-range projects, to study maintenance of favorable customer relations as they relate to billing and accounting. Under E. G. Prentice, NEGEA Service Corp, the committee will continue into its third year the long range manual project, "Customer Relations Training by Manual and Films."

Depreciation . . . Has slated a short-term project surveying types of mortality dispersion curves applicable to various plants. G. T. Logan, Philadelphia Electric Co, heads the group.

General Accounting . . . Will form a new subcommittee, Methods and Procedures Work, which will analyze effectiveness of accounting methods and procedures now being used and make recommendations for improving them. H. W. Boozer, Georgia Power Co, is committee chairman.

Internal Auditing . . . Is formulating procedures to cover "Materials and Supplies", "Property Records", "Payrolls", and "Cash and Securities". Committee chairman is W. T. Hamilton, CEICo.

Plant Accounting and Records . . . Plans to continue projects covering machine accounting, simplification of cost accounting, and similar subjects. Committee is headed by E. D. King, Detroit Edison.

Taxation Accounting . . . Will review state and local taxes to compile a list of all taxes levied on utilities by states. The group, headed by L. F. Scholley, has named a subcommittee to develop arguments to be presented to Congress on federal tax legislation.

YALE PROJECT of Pacific Power & Light Co is taking shape on the Lewis River in south central Washington. Boundaries of the 4 million cu yd earth fill dam are marked out in the picture above. The project eventually will generate 100,000 kw

USBR Restricts Variation in Tail Water at Coulee

To limit to a safe maximum quick drops in water level after prolonged periods of high water, the Bureau of Reclamation has restricted variation in tail water, and therefore power output, at Grand Coulee to not more than four ft per 24 hours. This limit is intended to forestall shore erosion and possibly slides for the existing conditions of bank material below the dam —shore protection by rip rap, and loads at the toes of bank slopes.

Porosity of the banks permitting infiltration as the tail water rises is blamed for the condition. When the elevation drops suddenly the water rushing back into the stream not only takes some of the fines with it but also exerts a considerable hydraulic pressure on the bank. Methods proposed for remedying the condition include placing further rip rap, driving sheet piling, and drilling positive pressure wells in the bank. The bureau has already spent $9 million on repairs.

Operations of the Northwest Power Pool have been affected to some extent by the restriction. The four-ft change in tail race level immediately below the dam corresponds to a change of about 26,000 cfs during winter operation. Since 5,000 cfs produces roughly 125 Mw, the four-ft range represents about 600 Mw. If used at full peaking capacity, the plant cannot be dropped down enough with the four-ft limitation over the light load period. If the plant is operated for minimum load conditions, full peaking capacity is not available without dropping the tail water more than the four ft allowed.

In either case some energy or capacity is not being utilized, the amount being estimated by those outside the Department of Interior at 600 Mw.

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Named to Michigan PSC

Maurice E. Hunt has been appointed a member of the Michigan Public Service Commission.

Hetherington Promoted to FPC Power Bureau

Marion F. Hetherington has been named assistant chief of the Federal Power Commission's Bureau of Power, moving up from his position as FPC's Atlanta Regional Engineer.

He is expected to assume his duties in Washington about mid-December, succeeding Francis L. Adams, who was appointed Chief of the Bureau of Power last June.

A career government employee, Hetherington joined the FPC staff in 1933, and has been attached to the Atlanta Regional Office since 1942. Before joining the commission, he was engaged in general private engineering practice in Danville, Va., and held engineering positions with the Southern Railway Co in North Carolina.

Born in Miami, Fla., the new assistant chief is a graduate of the university of North Carolina. In his new position, Hetherington's chief duty will be to coordinate the work of the commission's regional offices.

5 New York Utilities Issue Niagara Booklet

The five New York utilities which wish to construct the Niagara power project at their own expense in contrast to other proposals by the State of New York and the federal government have published a booklet stating their side of the story.

The booklet, entitled "More Power from Niagara," plays up six major points:

1. The private companies would pay taxes on the project.
2. They pioneered in using the Niagara for power production.
3. Niagara Mohawk Power Corp has been ready for years to build such a project, made possible only by the 1950 treaty with Canada.
4. The companies have the engineering ability, familiarity with the problems involved, and the financial ability.
5. This is a straight power project. Navigation, flood control, etc. are not involved.
6. Neither state nor federal construction is needed.

The booklet will be distributed later by the five sponsoring companies: Central Hudson Gas & Electric Corp, Consolidated Edison Co of New York, New York State Electric & Gas Corp, Niagara Mohawk Power Corp, and Rochester Gas & Electric Corp.

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Says Strength Depends on Industrial Productivity

Most modern approach in building America's strength is industrial productivity, according to Glenn Campbell, manager, Newark (N.J.) office of General Electric Co.

He keynoted a forum, "Industrial Productivity—The Decisive Weapon," presented Nov. 14 for more than 150 New Jersey industrial leaders at Somerville, N. J. Sponors were New Jersey Power & Light Co and GE. Exhibits included lighting sources, various electric heating units, motor and control applications, and models of materials handling equipment.

Energy requirement rose from 113 to 140 billion kwhr for industrial use in last three years, stated forum chairman, F. W. McChesney, Industrial Dept., General Electric Co, Schenectady, N. Y. Since a 1-hp motor does the work of 17 men, and 6 kwhr are consumed for one man-hour, he said, the way to increase productivity is obviously to use more and more electric power.

In the panel presentation "Modern Methods for Critical Production," W. C. Bloomquist, Industrial Engineering Department, GE, pointed out the flexibility of load center distribution systems and their low cost of expansion. He recommended that for uniformity of voltage primary service be at 4.1 kv for loads of 10,000 kva and 13.2 kv for loads above 20,000 kva.

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Ohio PUC Puts Off Hearing

A hearing on a dispute between Newton Falls, Ohio, and Ohio Edison Co has been postponed indefinitely by the Public Utilities Commission. The village had sought to have the commission prohibit Ohio Edison from using public streets and alleys for its poles and wires and wanted the village light plant to serve the Newton Falls area exclusively. It is reported that the disputants now are seeking an agreement to eliminate overlapping service.

C of C Says U. S. Projects Should Add Road Costs

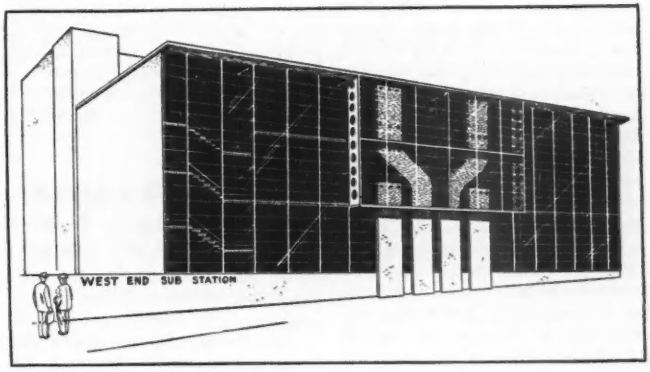
The federal government should bear the full burden of relocating access roads to forest and other resources cut off by federal construction of multipurpose water projects.

Costs for this work should be included in the overall project cost, and be figured in the benefits-cost ratio presented to Congress in justifying construction of the project.

These were among the proposals recently adopted by the board of directors of the U. S. Chamber of Commerce in approving a report by its Natural Resources Committee.

The board also proposed that in acquiring private lands for water projects, the government should provide landowners with an equivalent in federally owned forest tracts.

In its report, the chamber's Natural Resources Committee said the federal agencies were meticulous in reporting all of the benefits of a project, both tangible and intangible, but usually ignored the adverse effects or "negative benefits" in figuring the benefits-cost ratio.



B. C. Electric to Build a Showcase

A "showcase" substation, designed to "sell" utility service to the public, will be erected by British Columbia Electric Co next year in downtown Vancouver.

The three-story, 100,000 kva unit will have a 4,000 sq ft front finished in glass so passers-by may see the equipment inside. Main control panels will be in full view, and at night the building and equipment will be illuminated. The utility plans to conduct tours for students and the public.

To be completed before the end of 1952, the building will be of reinforced concrete, steel, aluminum and glass. The architecture will be contemporary. In the picture above, powerline ducts are seen leading up from underground cables.

Changes in Capacity Reported to Federal Power Commission

PLANT ADDITIONS DURING SEPTEMBER

State	Utility	Plant	Fuel	Capacity (Kw)
Mass.	Holyoke Gas & Electric Department	Holyoke	S	10,000
N. Y.	Consolidated Edison Co of New York, Inc	East River	S	125,000
N. Y.	Jamestown Municipal Electric Department	Jamestown	S	20,000
N. Y.	Rockland Light & Power Co	Hudson	S	22,000
Pa.	Weatherly Borough Light & Power Department	Weatherly	IC	1,000
Ohio	Toledo Edison Co	Acme	S	60,000
Ill.	Freeburg Municipal Power & Light Department	Freeburg	IC	645
Mich.	Allegan Board of Public Works	Allegan	IC	1,125
Mo.	Kansas City Power & Light Co	Hawthorn	S	60,000
S. D.	La Creek Electric Association, Inc	Martin	IC	300
Kan.	Oakley Municipal Light Department	Oakley	IC	575
Kan.	Sharon Springs Municipal Light & Power Department	Sharon Springs	IC	521
Md.	Consolidated Gas, Electric Light & Power Co of Baltimore	Riverside	S	75,000
W. Va.	Monongahela Power Co	Rivesville	S	74,750
Fla.	Jacksonville Electric Department	Southside	S	60,000
Fla.	Florida Keys Electric Cooperative Association, Inc	Tavernier	IC	1,000
Okla.	Grand River Dam Authority	Chouteau	S	15,000
Utah	Utah Power & Light Co	Gadsby No. 1	S	66,000
Wash.	Bureau of Reclamation	Grand Coulee Dam	H	108,000

PLANT RETIREMENTS DURING SEPTEMBER

N. Y.	Rockland Light & Power Co	Cuddebackville	H	1,200
Iowa	Manilla Municipal Service Department	Manilla	IC	119
N. D.	Otter Tail Power Co	Westhope	IC	30
Neb.	Sidney Public Utilities	Sidney	IC	331
Kan.	Oakley Municipal Light Department	Oakley	IC	200
W. Va.	Potomac Light & Power Co	Petersburg	IC	85
Fla.	Florida Power & Light Co	Daytona	S	500
Ky.	Kentucky Utilities Co	Maysville	S	1,750
Tenn.	Cookeville Water & Light Plant	Burgess Falls	H	360
La.	New Orleans Public Service, Inc	Market St	S	15,000

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of October 1—Hydro, 18,619,236 kw; Internal Combustion, 1,952,145 kw; Steam, 53,745,425 kw; Total, 74,316,806 kw.

South Carolina E&G Will Build 150-Mw Aiken Plant

Construction of a 150,000-kw steam plant of the newly formed South Carolina Generating Co will begin early next year. The plant will be erected on a 122-acre site on the South Carolina side of the Savannah River about 14 miles west of Aiken, S. C. Its location will make it a convenient source of power for the Aiken installation of the Atomic Energy Commission.

The plant will be designed to burn either pulverized coal or oil. Two 75,000-kw units are to be in operation by the summer of 1953. But two other units of the same size may be added later. The first two units will give South Carolina Electric & Gas Co a total capacity of over 504,730 kw. The generating company is a wholly owned subsidiary of Electric & Gas.

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Water Users Sell Plants

Water users in three irrigation districts of the North Platte River Valley in western Nebraska and eastern Wyoming have voted to sell their interest in two hydroelectric plants to the federal government. The plants involved are located at Lingle and Guernsey, Wyo. The three districts—Gering-Fort Laramie, Pathfinder, and Goshen—agreed to sell their interest to the government for $6,636,873. That amount will be credited against the original debt incurred by the three districts when the government advanced funds for construction of the irrigation system.

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EEI Puts Out New Edition of Utility Industry Booklet

The 1951-52 edition of "I Want to Know About the Electric Industry" has been published by Edison Electric Institute. The booklet, now in its fourth annual edition, outlines the progress of the electric industry in the U. S. through peace and war and presents the industry's program for maintaining an adequate power supply in the years ahead.

Making extensive use of tables on capacity, sales, income, capitalization, customers, employees, etc., the booklet is prepared as a reference for those wishing concise information on various aspects of the electric industry. Copies of this booklet may be obtained by writing to the Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y.

Engineers' Starting Pay Rises 16%, Survey Shows

Engineering graduates are receiving starting salaries about 16% higher this year than in 1950, results of a survey conducted by New York University's College of Engineering show.

The college sent out questionnaires last September to the 329 graduates of its 1951 Day Division Class and received replies from 216, or 66%, of the class.

The average starting salary for the entire class, it was reported, is $301 a month, compared with $260 in 1950, $253 in 1949, $252 in 1948, and $227 in 1947. Electrical engineers filling out questionnaires reported starting salaries averaging $288 a month as against $275 in 1950, $248 in 1949, $251 in 1948, and $237 in 1947.

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Georgia Power Names 'Home Town' Winners

Greenville, Arlington, and Dublin have been named first prize winners, in their respective population groups, in the 1951 Champion Home Town Contests conducted by Georgia Power Co. Vice Pres Charles A. Collier said Franklin, first prize winner from last year, received a sweepstakes award in a special contest open only to former first prize winners.

Each of the four towns will receive a bronze plaque and a cash award of $1,000.

ROGER L. PUTNAM, former mayor of Springfield, Mass., has been appointed to succeed Eric Johnston as Economic Stabilization Administrator

Copper Division—National Production Authority
(Prepared by Electrical World, Nov. 12, 1951)

Office of the Director

Director—Frank H. Hayes (X3318)
Deputy Director—Joseph W. Mullally (X3275)
Consultants to Director—Alvin A. Meyrowitz, Milton Levenson, Michael Schwarz (X5428)
Administrative Assistant—Miss Rosanne Nython (X4921)

Wire Mill Branch—Chief, Edward S. Rising (X5924)

Assistant Chief—M. O. Porter (X5923)
Components & Technical Section—Daryl R. DeRoche (X5076)
Production & Facilities Section—Charles W. Ange (X5463)
Warehouse Section—William J. Dwyer (X3968)
Program Section—Avery H. Gould (X5922)
Allocation Section—Frank Spitale (X4924)

Brass Mill Branch—Chief, Paul B. Andrews (X4920)

Assistant Chief—Lenox C. Chew (X3943)
Ass't to Ass't Chief—Pembroke W. Taylor (X5403)
Production & Scheduling Section—William L. Ashlock (X5973)
Facilities & Components Section—Edward B. Blakely (X4926)
Technical Section—Herbert A. Bedworth (X5468)
Warehouse Section—Lenox C. Chew (X3943)
Program Section—John V. O'Connor, Jr. (X5468)
Allocations & Records Section—Lorin O. Thompson (X4925)

Foundry Branch—Chief, Lt Comdr William A. Meissner, Jr (X3376)

Production, Facilities & Scheduling Section—Walter M. Clark (X6044)
Allocation & Records Section—J. Richard Varndell (X3970)
Technical Section—Harold B. Gardner (X5429)
Program Section—Dennis F. O'Connor (X5469)

Copper Raw Materials Branch—Chief, Myron L. Trilsch (X5404)

Scrap Section—C. F. Williams (X5069)

Program & Requirements Branch—Chief, William E. Bradford (X4614)

Conservation Section—Lionel T. Bonner (X4607)
Statistics & Reports Section—Glenn G. Haycraft (X4724)
Orders & Regulations Section—Harry A. Barron (X5497)
CMP & Program Section—James B. Forman (X4608)

All sections are located in the northwest corner of the 3rd floor of the New General Accounting Office Building between "G" and "H" Sts. and 4th and 5th Sts., NW, Washington 25, D. C. Use H St. entrance. Telephone extensions are on STerling 5200.

White-Collar Workers Get Break; GSO No. 6 Permits Wage Raises

White-collar workers have finally gotten a break from the Salary Stabilization Board. Its General Salary Order No. 6 permits employers to give them the same percentage raise given hourly employees under Wage Stabilization Board rules.

Since last August the white-collar group has been denied the cost-of-living increases given to the manual workers, mostly union members. Roughly SSB rules apply to those executive, professional, and administrative employees and "outside salesmen" who receive a salary, do not get overtime under the federal Wage-Hour Act, and do not belong to a union.

A few weeks ago SSB in GSO No. 4 permitted employers to compensate foremen and other comparable supervisors who had to work more hours because of longer shop schedules.

Now GSO No. 6 permits a further boost to the entire white-collar team. The employer figures the percentage increases granted to hourly workers since January. He does not count anything given under the 10% "catchup" or for merit or length of service because salaried employees are already entitled to this under other SSB regulations.

The employer then can apply this percentage to his salary payroll and come up with a salary increase fund that he can pass around to the salaried group. But he is not free to pass it out as he pleases. This is what he must do:

1. He must restore the normal differential that existed between the hourly workers and the foremen and similar supervisors. This might be more than the percentage by which the hourly wages had risen. If so, he must apply whatever amount is necessary.

2. The employer must try to correct what inequities exist within the entire salaried group.

3. After that he can spread the rest of the fund among any of the salaried employees with only this limitation. No one employee can get—from this part of the fund—a percentage increase of more than that used in computing the fund.

For example, if hourly wages have risen 3%, the fund is computed by taking 3% of the salary payroll. No employee can get from the remainder of the fund after salary inequities are corrected more than a 3% increase. But with raises to correct inequities an employee can get more than a 3% total increase.

If the salary increase fund is not exhausted by these increases, the remainder can be added to a bonus fund.

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Industry M Orders

Copies of the following M order and amendment may be secured from the National Production Authority, Washington 25, D. C., or any regional office of the Department of Commerce:

M-90 prohibits the manufacture of **color television** sets and other items, such as color attachments for black-and-white sets, designed solely to permit or facilitate reception of color television. This does not affect the manufacture of such equipment for experimental, defense, or industrial uses.

Amendment 1 to M-9 reduces from 20 to 10 tons the amount of **slab zinc** that can be purchased in any month without an allocation certificate. Becomes effective Jan. 1.

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Leonard Joins DPA

A. B. Leonard, Los Angeles consulting engineer, has joined Defense Production Administration to work with J. Warren McLaughlin on electric power problems.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds 1st	Bonds 2nd	Bonds 3rd	Preferred Stocks 1st	Preferred Stocks 2nd	Preferred Stocks 3rd	Common Stocks 1st	Common Stocks 2nd	Common Stocks 3rd
DATE									
1951									
Nov. 21	2.99	3.07	3.17	4.25	4.48	4.78	5.44	6.19	6.93
Nov. 15	2.98	3.05	3.15	4.24	4.46	4.79	*5.42	6.16	6.85
END OF QTR.									
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.78
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44

*Revised

Geo. Bois & Chandler, Inc.

Price to 3 Washington PUD's Set in Proposed Puget Sound Purchase

Three of the seven Washington State PUD's which plan joint purchase of Puget Sound Power & Light Co have learned the extent of their liabilities under the $96.8 million transaction proposed in a report prepared by R. W. Beck & Associates, consulting engineers.

Kitsap County, across Puget Sound from Seattle, will be called upon for $24,448,000; Skagit County, of which Mount Vernon is the county seat, for $19,549,000; and Chelan County, the only eastern Washington PUD involved, for $9 million.

Chelan's share is for joint purchase of the company's generating facilities, as it had already purchased Puget Power's distribution facilities in its area. The Kitsap and Skagit shares include distribution facilities in their counties and a portion of the expense of purchasing the generating facilities, as well as distribution facilities in King and Pierce Counties, which have no PUD's.

Shares of the Whatcom, Jefferson, Snohomish and Thurston PUD's have not yet been reported. Snohomish already has purchased Puget Power distribution lines.

Acceptance of the plan has been attacked by J. W. Bryan, minority member of the Kitsap PUD, who claims the company's Kitsap holdings are not worth more than $5 million.

Frank McLaughlin, president of Puget Sound Power & Light Co already has advocated outright sale to the seven PUD's as the only alternative to eventual dismemberment by condemnation.

Using an assumed purchase price of $96.8 million as a base, he estimated that his stockholders ultimately would receive "something in excess of $20 per share—conceivably the approximate book value of the common stock (at present around $23 per share)."

He said it would probably take several years to liquidate the company, but there would be an initial liquidating dividend at the time of closing, with additional disbursement to be made from the remaining proceeds as liabilities were ascertained and discharged.

"It is desired to point out," he added "that even if an over-all purchase proposal is presented to the company, it will not provide complete assurance of legal and financial ability of the prospective buyers to perform. In view of the many existing uncertainties, it would be risky for anyone to assume too much at this time with respect to the end result as far as the company's stock is concerned."

"Regardless of rumors to the contrary," he declared, "an over-all acquisition is not something that can be accomplished overnight, but it should come into being after full and careful consideration on its merits. Real statesmanship, unity of purpose and action, are essential to a constructive solution of the pressing power problem in Puget's service area."

Guy Meyers, PUD fiscal agent, and R. W. Beck, consulting engineer, have been meeting individually with the PUD commissioners of the various counties.

FINANCIAL BRIEFS

Program committee of the New York Society of Security Analysts has scheduled the following luncheon meetings in December: Dec. 10, Southwestern Public Service Co; Dec. 12, Shawinigan Water & Power Co; Dec. 17, Electric Bond & Share Co; and Dec. 26, Public Service Co of New Hampshire.

Coast Counties Gas & Electric Co has received California Public Utilities Commission approval to sell $3 million 3½% bonds due 1981 to institutions.

Electric Utility Financing

Company and Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
WEEK OF NOVEMBER 22-28			
Bonds			
Central Illinois Light—1st mtg 1981 new money	$ 8,000	100.574%	3.22%
WEEK OF NOVEMBER 29-DECEMBER 5			
Bonds			
Central Maine Power—1st and gen mtg 1981	$ 7,000	.....	.....
Preferred Stock			
Northern Indiana Public Service—240,000 sh, $25 par 4.56% conv, into common sh-for-sh through Dec. 1, 1961, preference stock (to common holders on 1-for-12½ sh basis, Nov. 9 to expire Dec. 3)	$ 6,000	$24.00	4.75%
Common Stock			
Central Maine Power—315,146 sh (to be offered to 6% pfd holders on 5-for-7 basis and to common holders on 1-for-7 basis; New England PS, holder of 49% of common, waiving its right to subscribe for 150,740 shares of new common; price to be determined by competitive bidding on Dec. 5)	.....	.....	.....
SCHEDULED DECEMBER-JANUARY			
Bonds			**Bid Date**
Virginia Electric & Power—1st mtg 1981	$20,000		Dec. 11
Long Island Lighting—1st mtg 1976	25,000		Dec. 12
Seattle, Wash.—muncipial light and power rev, 1962-1986	28,000		Jan. 8
Indiana & Michigan Electric—1st mtg 1982	17,000		Jan. 22
Indiana & Michigan Electric—serial notes 1956-1967	6,000		Jan. 22
Common Stock			
Public Service Co of New Hampshire—235,809 sh $10 par	.....	.....	Dec. 11

MEETINGS

American Institute of Electrical Engineers
Feedback Control Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., December 6-7; Computer Conference, Benjamin Franklin Hotel, Philadelphia, December 10-12; Winter General Meeting, Hotel Statler, New York, January 21-25, 1952.

Public Utilities Advertising Association
Region 2 Meeting, Advertising Club of New York, New York, December 7.

Chicago Lighting Institute
Industrial Production-Safety Lighting Clinic, Chicago Lighting Institute Auditorium, Chicago, December 7.

★**Edison Electric Institute**
Accident Prevention Committee, Hotel Roosevelt, New Orleans, January 7-8, 1952; Electrical Equipment Committee, Netherlands Plaza Hotel, Cincinnati, Ohio, February 11-12, 1952; Transmission-Distribution Committee, New Hotel Jefferson, St. Louis, February 14-15, 1952.

Instrument Society of America
1952 Regional Power Plant Instrumentation Conference, New York Section, Hotel Statler, New York, February 7-8, 1952.

Missouri Valley Electric Association
Industrial-Commercial Sales Conference, Hotel President, Kansas City, Mo., February 7-8.

Public Information Program
East North Central Region Meeting, Fort Wayne Hotel, Columbus, Ohio, February 19, 1952.

Pennsylvania Electric Association
Winter Meeting, Relay Committee, Fort Stanwix Hotel, Johnstown, Pa., February 20-21, 1952; Prime Movers-Electrical Equipment Committees, Benjamin Franklin Hotel, Philadelphia, February 28-29, 1952.

American Society for Testing Materials
Spring Meeting-Committee Week, Hotel Statler, Cleveland, March 3-7, 1952.

National Electrical Manufacturers Association
Section Meeting, Edgewater Beach Hotel, Chicago, March 10-13, 1952.

National Association of Corrosion Engineers
Annual Conference, Buccaneer Hotel, Galveston, Tex., March 10-14, 1952.

American Society of Mechanical Engineers
Spring Meeting, University of Washington, Seattle, March 24-26, 1952.

★**Oklahoma Utilities Association**
Annual Convention, Biltmore Hotel, Oklahoma City, March 27-28, 1952.

★ Addition this week.

Anaconda Aluminum Plans Are Blocked by Chapman

Interior Sec Oscar L. Chapman has yanked a contract for power out from under Defense Production Administration's plans to put Anaconda Copper Co in the aluminum business.

DPA's plans hinged on transferring power already contracted for by Harvey Machine Co to an Anaconda-Harvey partnership. Harvey's contract with Bonneville Power Administration called for 37,000 kw of firm capacity, and 74,000 kw of interruptible power from the Hungry Horse development at Kalispell, Mont. That would be enough power for three potlines.

But Chapman wrote DPA that he would not make a contract with Anaconda-Harvey for the power, on the grounds that Anaconda's entry into the picture might promote monopoly (EW, Nov. 12, p 14; Nov. 26, p 14). After writing the letter, he left for a month's tour of western states and Hawaii, leaving DPA with the job of patching up its aluminum plans.

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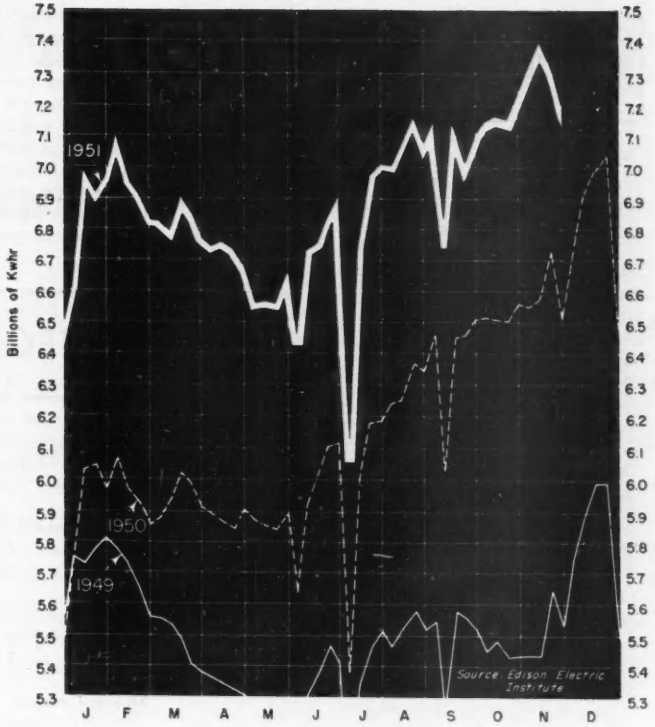
Establish Safety Record

Overhead line workers of Detroit Edison Co's Oakland Division have established a record of 1,025,000 manhours of work without a single disabling injury accident.



Output Week Ended Nov. 24—7,157,038,000 Kwhr

Weekly Output, Millions Kwhr		
1951	1950	1949
Nov 24 7,157	Nov 25 6,508	Nov 26 5,537
Nov 17 7,333	Nov 18 6,728	Nov 19 5,644
Nov 10 7,396	Nov 11 6,574	Nov 12 5,435
Nov 3 7,319	Nov 4 6,551	Nov 5 5,435
Oct 27 7,234	Oct 28 6,563	Oct 29 5,433
Oct 20 7,149	Oct 21 6,503	Oct 22 5,430
Oct 13 7,160	Oct 14 6,509	Oct 15 5,481
Oct 6 7,156	Oct 7 6,514	Oct 8 5,450
Sept 29 7,102	Sept 30 6,503	Oct 1 5,521
Sept 22 7,014	Sept 23 6,457	Sept 24 5,556

Per Cent Change from Previous Year			
	Nov 24	Nov 17	Nov 10
New England	+ 3.3	+ 0.2	+ 6.6
Mid-Atlantic	+ 9.0	+ 7.4	+10.5
Central Industrial	+ 6.3	+ 6.4	+ 8.5
West Central	+10.2	+11.1	+11.3
Southeast	+12.5	+12.1	+18.7
South Central	+19.9	+21.1	+18.9
Rocky Mountain	+11.8	+11.0	+12.0
Pacific Coast	+12.1	+ 8.5	+15.3
Total United States	+10.0	+ 9.0	+12.5

Canadian Output Statistics

The following statistics on electrical energy production by Canadian central stations, supplied by the Dominion Bureau of Statistics, are in thousands of kilowatthours:

Period	1951	1950
Nine Months' Output	42,432,954	37,375,284
Primary	39,477,116	34,753,130
Secondary	2,955,838	2,622,154
Primary Consumption	38,289,245	33,598,445
Net Exports to U. S.	1,747,259	1,463,708
September Output	4,404,216	4,121,496
Primary	4,271,436	3,983,443
Secondary	132,980	138,053
Primary Consumption	4,147,536	3,851,637
Net Exports to U. S.	128,590	142,839
August Output	4,595,761	4,198,697
Primary	4,446,090	3,982,445
Secondary	149,671	216,252
Primary Consumption	4,314,959	3,848,764
Net Exports to U. S.	159,586	149,546

WASHINGTON COMMENT

JESSE MOCK

Of the government studies now being made of the nation's electric power situation, the one conducted by a Congressional committee staff could have the greatest impact on the present power expansion program.

This study was authorized just before Congress adjourned in October by the "watchdog" Committee on Defense Production. Composed of key members of the House and Senate Banking and Currency Committees, which wrote the Defense Production Act, this group is charged with keeping a close eye on all mobilization agencies.

At present, several staff members of the "watchdog" committee are busy getting together the basic information on power supply and requirements for the next few years. They are collecting authoritative opinion, from people in the industry as well as the facts and figures supplied by government agencies.

Trying to Spot Power Bottlenecks in Advance

The staff members are trying to determine where electric power bottlenecks might occur in the defense production program and to find what can be done to prevent them. The report, when it is given to the committee in late December, will boil down to the critical question: "What is needed to assure a sufficient supply of electricity to meet defense production needs?"

Should the power supply outlook appear critical in some defense areas, it is certain that committee members will want to know the full story. In which case, the staff report will be a prelude to a full "watchdog" committee investigation.

As everybody in the industry knows, the main delaying factor in the electric power expansion program is lack of materials. This includes not only reduced CMP allotments but the further difficulty of converting these allotments into needed material and equipment.

If the committee decides that the power program is slipping behind other phases of the mobilization expansion, it certainly has the means of making some changes.

It could do this by recommending amendments to the Defense Production Act giving defense-supporting industries a better break in securing materials. This would be a long drawn-out process requiring a majority vote of Congress.

A Word Would Give Power Industry Preference

This would probably be unnecessary since a strongly-worded suggestion from the committee would carry great weight with the top mobilizers. A word from the committee would probably be all that is needed to get preference for the industry. For whether one likes it or not, the mobilization machinery in Washington is very sensitive to the desires of this committee.

The one disadvantage in solving the electric utilities' material problem at the Congressional level is that it could throw the mobilization program out of balance. Strong Congressional pressure to speed up electric power expansion would likely mean a slowdown of some other part of the overall program.

Conceivably, electric power expansion over a three or four year period could move ahead of the very segments of the mobilization program it is designed to serve. While this would not be true on a nationwide basis, it could happen in a number of individual cases.

In considering the desirability of a Congressional assist in getting the desperately needed material and equipment, the industry should be aware that it has drawbacks as well as advantages.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Steam interconnection of the boilers for two 60-Mw units was omitted because it would cost $100,000 or more and add negligibly to plant reliability.

Fuse omission in large installations of capacitors can prove costly if circuit conditions permit large fault currents to flow into the individual units.

Seldom used interconnections may be improperly manipulated due to unfamiliarity and cause more disturbance than they would avoid in an emergency.

Moisture content of continuously travelling fabric can be evaluated by instrument observation of the varying stress between fixed points.

Electrodeposition in reverse has been used to produce wire 0.00015 inch diameter (one-tenth human hair); the wire is made an electrode in an electropolishing bath until reduced to desired size.

Surge impedance loading in kw for practically all high voltage lines using single conductors per phase is substantially 2.5 times the square of the kilovolts.

Capacitor units for 2.4 kv or less are generally connected delta and fuse protection is desirable to prevent case rupture in case of faulting.

Complete remote supervision of all operations demands devices that will promptly indicate faulty performance and, if possible, set the correctives in motion automatically.

Thickness of resin-coated fabrics is determined by a beta-ray gauge which combines radioactive techniques with electronics.

Capability of transmission is increased 80% when a third circuit is added to two (with one sectionalizing station) and switched with them.

Aluminum carrying small percentages of iron and magnesium has conductivity and mechanical strength which make the larger 3,000 rpm generators feasible.

Future Farm Market Heads for Record Growth

Half billion dollar market for electrical goods and nearly double present use of energy in 5 years is predicted from survey of makers of electrically-operated farm equipment. Data cover production operations only, not the farm home

FRANK R. INNES, Associate Editor, Electrical World

A market for electrical goods of the order of $500 million in the 5 years, 1951-1955, may be anticipated in the field of electrification of farm production operations. Resulting from this sale of products will be an increase in annual use of electricity in these operations from over 3 billion kwhr at present to more than 5 billion. These potentialities are entirely realizable in view of the rising cost and the declining availability of farm labor.

Summarized in Tables I and II are the data on which the above estimates are based. The data are the result of a joint study undertaken by the National Electrical Manufacturers Association and Electrical World. It will be noted that the total potential market for electrical goods shown by Table I is considerably less than $500 million. To this total there had to be added estimates covering several important aspects of farm electrification on which detailed information is not obtainable, as will be explained later.

Not Out of Line . . . It is estimated that the annual consumption of electricity on American farms now amounts to around 15 billion kwhr. Studies made by the Bureau of Agricultural Economics, USDA, in various regions of the country give some indication of the division of electricity use as between the farm home and farm production operations. This is that the house uses 70 to 80% or more of the total. The figure of 3 billion kwhr arrived at by totalling the 30 applications covered in Table II does not seem out of line with this indication of ratio. In this connection, it may be remarked that, while the 30 applications do not include all productive uses of electricity on farms, they do represent quite completely those whose energy consumptions are highest. Thus the kwhr totals of Table II may be taken as conservative approximations.

New Developments . . . Considering that present applications of electricity in farm production are continually being extended and that new ones appear frequently, any

Appalachian Electric Power Co

Cincinnati Gas & Electric Co

FARMSTEAD LIGHTING is a market that will reward sales efforts by both manufacturer and utility

Electrical World-NEMA joint study shows large potential of market for electrical goods and electricity in farm production operations

market projection in this field must include some provision for these developments. Forced air drying, for instance, developed for, and at first applied to, forage crops, is now being extended to root crops. No one can tell what may come of research in high frequency and supersonic energy in the way of pest control and of processing and preserving human and animal food on the farm. These possibilities cannot be neglected as the future market for electrical goods is envisaged.

Taking this into account, plus provisions for energy supply, wiring, and electrical goods purchased as such and not included in farm equipment, the potential of $500 million in sales of electrical products in the years 1951-1955 seems conservative rather than otherwise.

Partial Picture . . . The data on electrical goods detailed and summarized in this report are confined strictly to those electrical products that are incorporated as components of farm production machines and equipment. They do not cover electrical goods, such as motors, controls, switches, heating units, etc, that farmers buy for application to machines or installations they already have.

Farmstead lighting cannot be separated from lighting in general. One maker of equipment for this purpose estimates this market at $3 million per year. That would add $15 million to the nearly $230 million total of Table I.

Shop Tools . . . Much electrical equipment is used in the farm shop. The makers of drill presses, grinders, shapers, lathes, saws, and other shop tools have no way of knowing what proportions of their sales are to farmers. With between 4 and 5 million farms now connected to electric lines, an estimate of $50 million for the 1951-1955 market for electrical goods in the farm shop assumes only about a $10 sale to each farm.

Farm welder sales, 1951-1955, are estimated at 300,000 units by one manufacturer. At an average price of $150, the 5-year market amounts to $45 million.

All of this electrical equipment has to be wired up. It is generally accepted that the cost of wiring materials and devices runs to about 10% of the cost of the equipment installed. Here is an additional $33.5 million, bringing the 5-year market up to nearly $375 million.

Supply Systems . . . Not on the farm itself, but resulting from increase in electrification of farm production, is another requirement for the products of electrical manufacturers. This is in the supply of electricity to the farm. Included are larger transformers, more and heavier lines, improved service protection in terms of lightning arresters, fuses, breakers, and communications and control equipment. In this connection, reference is made to the Sept. 24, 1949, Electrical World article, "Managers of Co-Operative Electric Systems Talk over Their Problems." They tell how they are having to increase transformer capacities and generally strengthen systems in order to handle growing loads. Other Electrical World references on this subject are September 24 and October 8, 1951, "Build for Bigger Farm Loads" and "Full-Use Farm Load," respectively. In these two articles, energy consumptions up to 30,000 and 40,000 kwhr annually are shown. The prospect of such usages of electricity by even a comparatively small number of farms indicates need for much re-inforcement and extension of supply facilities. A most conservative estimate of what this will require for electrical materials and equipment in 5 years is $100 million. The total thus becomes $475 million.

This leaves $25 million unaccounted for in the $500 million estimate. Is it unreasonable to assume that the new developments in electrical applications on the farm, earlier

Table I — Estimated 1951 — 1955 Markets for Electrical Products Incorporated as Components in Farm Production Machines and Devices — $1,000

Applications	Motors	Starters	Heating Units	Thermostats	Plugs and Cords	Miscellaneous[1]	Totals
Automatic Water Supply Systems	24,600	500	.....	.....	.....	2,870[3]	27,970
Pump Jack Assemblies	5,250	250	.....	.....	.....	.....	5,500
Irrigation Systems	70,000	3,500	.....	.....	.....	.....	73,500
Stock Tank De-Icers	.....	.....	175	.....	.....	.....	175
Stock Water Tank Heaters	.....	.....	613	.....	.....	.....	613
Seed and Grain Cleaners	600	.....	.....	.....	50	.....	650
Cup-Type Elevators	350	.....	.....	.....	.....	.....	350
Portable Conveyor Elevators	18,000	4,000	.....	.....	375	.....	22,375
Wagon Unloaders	130	.....	.....	.....	8	.....	138
Hay and Feed Hoists	263	20	.....	.....	.....	.....	283
Silo Unloaders	180	100	.....	.....	.....	.....	280
Barn Cleaners	2,713	200	.....	.....	.....	.....	2,913
Feed Grinders	5,250	600	.....	.....	.....	.....	5,850
Barn Cleaners	600	.....	.....	300	.....	.....	900
Hay Curing Systems	5,250	525	.....	.....	.....	.....	5,775
Crop Driers	3,250	.....	.....	.....	.....	675	3,925
Electric Fence Controllers	.....	.....	.....	.....	.....	3,500	3,500
Milkers	11,475	.....	.....	.....	.....	.....	11,475
Cream Separators	3,000	.....	.....	.....	.....	.....	3,000
Milk House Heaters	.....	.....	.....	.....	.....	.....	1,038
Milk Can Hoists	45	.....	415	623	.....	.....	45
Milk Coolers	.....	.....	.....	.....	.....	45,000[2]	45,000
Milk Utensil Sterilizers	.....	.....	613	350	219	.....	1,182
Incubators	.....	.....	40	100	50	.....	190
Poultry Brooders	.....	.....	1,500	.....	.....	.....	1,500
Automatic Poultry Feeders	1,400	.....	.....	.....	.....	400[4]	1,800
Poultry Water Warmers	.....	.....	1,000	1,000	.....	.....	2,000
Egg Graders	66	.....	.....	.....	.....	.....	66
Egg Cleaners	12	.....	.....	.....	1	.....	13
Lineal Heaters	.....	.....	.....	.....	.....	7,500[5]	7,500
Totals	**152,424**	**9,695**	**4,356**	**2,373**	**703**	**59,945**	**229,496**

Notes: (1) Where not explained by the following specific notes "Miscellaneous" includes special transformers, condensers, solenoid valves, rectifiers and various controls (2) Pressure switches. (3) Refrigeration units. (4) Time switches. (5) Heating cable and tape.

mentioned, will more than take up that slack?

The study was based on a survey of makers of electrically operated farm production equipment. They were asked for the number of their products presently in use, number sold in 1950, and number they expected would be sold in the 5 years, 1951-1955. It was requested that estimates of future sales be made in the assumption that materials would be available for manufacture of products and that a receptive market for them would exist.

It has been stated frequently that there are over 200 practical applications of electricity on the farm. In a recent article in the New York Times' Sunday magazine, REA Administrator Claude Wickard puts the number at over 400. Obviously, the survey could not cope with any such numbers of applications. Also there is much overlapping in the 200 and 400 estimates in respect to equipment and machines required by them. Accordingly, it was decided to limit the survey to a selected group of applications on which it was hoped that definitive information could be obtained in terms of present and future use.

Scope of Survey . . . Covered in the questionnaire were 34 applications. It was sent to 104 manufacturers selected as representative of the products included. Replies came back from 51 of them. In a total of 90 answers, they covered 30 of the applications listed in the questionnaire. Additional applications were reported on by two manufacturers, making a total of 32 covered by the survey. Of these, two were dropped from consideration as being household applications.

Wide Variations . . . Ideas of different manufacturers as to present use and future market for their products were very diverse. It had been intended that averages of figures in replies would be taken as expressing combined opinion and used as bases for conclusions of the survey. But this was found to be impractical.

Advice Asked . . . It was decided to submit the replies to a group of experts to assist in arriving at definite figures. Participating in this were the following men:

Truman E. Hienton, Head, Division of Farm Electrification, Agricultural Research Administration, U.S.D.A.

Joe F. Davis, Agricultural Economist, Bureau of Agricultural Economics, U.S.D.A.

J. P. Schaenzer, Head, Electro-Agriculture Section, Technical Standards Division, Rural Electrification Administration, U.S.D.A.

Harold H. Beaty, Rural Service Manager, Edison Electric Institute.

Table II — Summary of Energy Use Estimates

Equipment	Average Kwhr/year	Kwhr/year End-1950 (1,000)	Kwhr/year End-1955 (1,000)
Automatic Water Supply Systems	250	490,000	650,000
Pump Jack Assemblies	180	124,000	137,000
Irrigation Systems	2,000	400,000	800,000
Stock Tank De-Icers	500	25,000	50,000
Stock Water Tank Heaters	1,200	180,000	490,000
Seed and Grain Cleaners	3	345	450
Cup-Type Elevators	15	330	450
Portable Conveyor Elevators	15	3,000	7,800
Wagon Unloaders	15	75	150
Hay and Feed Hoist	20	80	110
Silo Unloaders	300	1,560	4,600
Barn Cleaners	50	375	1,000
Feed Grinders	150	7,500	10,000
Barn and Poultry House Vent. Assem	500	17,500	37,500
Hay Curing Systems	1,500	15,000	38,000
Crop Driers	500	2,500	7,500
Electric Fence Controllers	100	25,000	42,500
Milkers	700	507,500	650,000
Cream Separators	90	90,000	108,000
Milk House Heaters	800	12,000	72,000
Milk Can Hoists	30	75	150
Milk Coolers	1,500	490,000	730,000
Milk Utensil Sterilizers	1,400	350,000	595,000
Incubators	70	14,000	15,000
Poultry Brooders	300	270,000	420,000
Automatic Poultry Feeders	450	2,700	20,700
Poultry Water Warmers	60	78,000	108,000
Egg Graders	45	243	380
Egg Cleaners (Dry)	300	210	450
Lineal Heaters	0.5/ft	17,500	42,500
Totals	.....	**3,124,493**	**5,039,240**

Walter Hemker, Farm Electrification Engineer, Westinghouse Electric Corp.

Arthur H. Hemker, Manager, Farm Industry Division, Apparatus Department, General Electric Co, represented by J. H. Oliver.

Russell J. Gingles, representing the National Electrical Manufacturers Association.

Frank Innes, representing Electrical World.

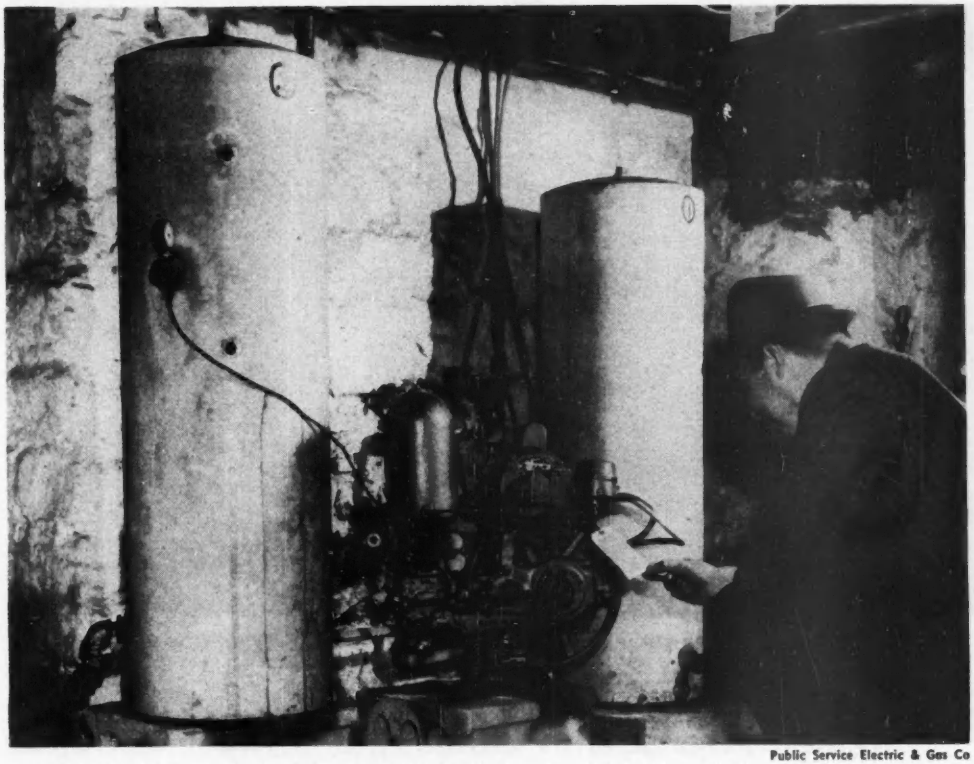
Values given are not necessarily those agreed upon by all present. They do not represent a consensus, but are as close to it as could be determined from discussion that sometimes was rather warm. Thus, having obtained what it considers to be the best advice, Electrical World assumes complete responsibility for the figures and conclusions.

All the Details . . . The following individual presentations of the 30 applications covered in the survey need no more explanation than is contained in them except, perhaps, in respect to prices assigned to products. It may seem strange to see the price of a thermostat set at $7.50 in one place and at $2 in another. There are different thermostats for different uses. Or to note motors in the range of ½ to 3 hp priced at $35 in one application and at $45 in the next one following. Or to see apparently the same starters given different prices. These differences result from judgment as to the dominance of larger or smaller equipment in the particular field.

1950 Census of Agriculture — Preliminary Data on 24 States

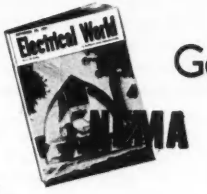
	Farms Reporting Electric Water Pumps	Farms Reporting Electric Chick Brooders	Farms Reporting Electric Power Feed Grinders	Farms Reporting Milking Machines	No. of Farms	No. of Electric Farms
Conn.	11,175	2,087	146	3,472	15,615	14,425
Delaware	4,665	493	80	1,053	7,448	6,112
Idaho	25,874	9,964	958	11,782	40,284	37,232
Iowa	116,983	57,942	2,644	42,305	203,159	184,787
Maine	14,798	2,225	205	4,770	30,358	26,200
Md.	20,765	6,577	807	5,559	36,107	30,302
Mass.	10,294	2,905	196	4,062	22,220	20,365
Minn.	101,391	25,021	2,573	65,139	179,101	150,155
Mo.	53,461	26,928	2,339	14,180	230,045	159,105
Mont.	15,134	4,686	592	3,153	35,085	26,335
Nebr.	38,115	18,196	1,204	9,452	107,183	83,309
Nev.	1,457	357	77	450	3,110	2,184
N. H.	7,904	1,699	114	2,931	13,391	12,696
N. C.	71,021	21,603	2,168	3,570	288,508	219,417
N. D.	19,812	3,723	849	7,612	65,401	44,200
Oregon	36,762	10,729	938	9,163	59,827	54,618
R. I.	1,862	287	26	493	2,598	2,411
S. C.	32,961	12,761	1,044	1,364	139,364	95,025
Tenn.	41,694	25,822	1,910	6,245	231,631	165,541
Utah	5,448	2,890	445	3,869	24,176	21,602
Vermont	7,595	2,263	96	9,832	19,043	17,533
Virginia	40,701	13,704	2,160	4,107	150,997	114,273
W. Va.	13,915	5,598	854	2,303	81,434	59,141
Wisc.	121,229	43,158	2,451	94,201	168,561	156,382
24-State Totals	**815,016**	**301,618**	**24,876**	**311,067**	**2,154,646**	**1,703,849**

The estimates of farm electric equipments presented in this article were made without benefit of the 1950 Farm Census data, which are now being processed by the Bureau and are expected to be released in complete form early next year. This unofficial compilation of data covering 24 states, made from available county figures, permits a rough check on the validity of the estimates for the equipments covered in the Census.



Public Service Electric & Gas Co

RUNNING WATER is usually the first, and certainly the best, service of electricity on the farm



General Farm Applications

Automatic Water Supply

Although an automatic water supply system often is, and most always should be, one of the first applications of electricity when a farm is connected, it is among the most difficult to assess in respect to farm electrification. This is because such systems are used in rural and suburban homes in much greater number than on farms. There is no way of telling from available data definitely how many are used on farms. However, it is possible to estimate from these data that farms account for about one quarter.

Conclusions from replies:

1.96 million systems in use on farms at end of 1950

0.181 million sold in 1950 for use on farms

0.82 million will be sold, 1951-1955, for use on farms

250 kwhr per year used by average system

490 million kwhr per year now being used by them.

Assuming that about 20% of those sold in the next 5 years will be replacements, it is indicated that farm water systems will be using electricity at around 650 million kwhr per year by the end of 1955.

Electrical Components	Average Price	1951-1955 Market
Motors, 1/6—15 hp.....	$30.00	$24,600,000
Pressure switches	3.50	2,870,000
Starters, sometimes included, 25,000 estimated	20.00	500,000
	Total	$27,970,000

Pump Jack Assemblies

In the early days of farm electrification, probably the most appreciated value of the service was that it could shove into history the "Armstrong" method of supplying water for 20 or 30 head of cattle. By a simple device of pulleys, crank, and push rod, an electric motor could be made to work the pump handle up and down until the water overflowed the stock tank. In these later years the pressure water system is replacing the pump jack.

Conclusions from replies:

688,000 pump jacks in use at end of 1950

Toledo Edison Co

OLD HAND PUMP is electrified with a jack

Appalachian Electric Power Co

SPRINKLER IRRIGATION hastens crop growth

Water, Available in Quantity and Right at Hand,

43,240 sold in 1950

150,000 will be sold, 1951-1955

180 kwhr per year used by average pump jack

124 million kwhr per year now being used by pump jacks

It is likely that many—say, one half—of the pump jacks sold in the next 5 years will be replacements. On this basis there will be about 760,000 in operation at the end of 1955, using around 137 million kwhr per year.

Electrical Components	Average Price	1951-1955 Market
Motors, 1/3–2 hp	$35.00	$5,250,000
Starters, sometimes included, 12,500 estimated	20.00	250,000
	Total	**$5,500,000**

Irrigation Systems

Most people think of irrigation in connection with the lands of the West where rainfall is scant and undependable. It is true that by far the largest irrigated acreage is west of the 100th meridian. But irrigation is becoming more and more a factor in agricultural production in the middle and eastern states, not alone for vegetables and fruits, but for field and meadow crops as well.

Data from the 1950 Census are not yet available, but the 1940 figures show 53,433 electric motors on irrigation pumps. Most of these are assumed to be fairly large 3-phase units and to be in the western states. A reasonable estimate from the 1940 data would put the number around 75,000 at the end of 1950.

Against this estimate are the figures of two replies. One sets the 1950 number at 4 million and the other at 1 million. The first reply is obviously much too high and the second probably is out of line also. But together they indicate either a definition of irrigation systems different from that of the Census, or that supplemental irrigation on eastern acreage has grown much faster since 1940 than the 1950 Census will show. It is probably significant that the two replies state minimum motor sizes of 1/3 hp and ¾ hp, indicating, perhaps, inclusion of systems too small to be included in the definition used by the Census.

In this apparent contradiction of data, there seems no other recourse in this report than to take a figure between them.

Conclusions from replies:

200,000 irrigation systems in use at end of 1950

50,000 sold in 1950

200,000 estimated to be sold, 1951-1955

2,000 kwhr per year used by average system

400 million kwhr per year now used by irrigation systems

Public Service Co of Northern Illinois

WARMED WATER is better than cold for stock

Cincinnati Gas & Electric Co

DE-ICER keeps stock tank from freezing over

Is a Necessity for Man, Beast, and Crop

800 million kwhr per year used at end of 1955.

Electrical Components	Average Price	1951-1955 Market
Motors, 1/3—250 hp.....	$350.00	$70,000,000
Starters, sometimes included, 100,000 estimated	35.00	3,500,000
	Total	$73,500,000

Stock Water Tank Heaters

More sensible than humans in this respect, cattle prefer to drink warm, rather than cold, water. This is particularly important in respect to milk cows, whose production is almost a direct function of their water intake. On the modern dairy farm a stock tank water heater comes close to being a necessity.

Conclusions from replies:

150,000 stock water heaters in use at end of 1950

30,000 sold in 1950

175,000 will be sold, 1951-1955

1,200 kwhr per year used by average heaters

180 million kwhr per year now used by these heaters

Most of these heaters now in use are of comparatively recent vintage and few need to be replaced in the next 5 years. The sale of them, 1951-1955, represents additional load almost entirely. This justifies an estimate of 490 million kwhr per year by the end of 1955.

Electrical Components	Average Price	1951-1955 Market
Heating units, 150—1,000 watts..	$3.50	$612,500

Stock Tank De-Icers

Like an oversize pancake floating on the water, this device prevents ice from forming in the tank where the cattle come to drink. It warms the water slightly, depending on its electricity input, which varies from 300 to 1200 watts, and to that extent functions as a tank heater.

Conclusions from replies:

50,000 de-icers in use at end of 1950

6,000 sold in 1950

50,000 will be sold, 1951-1955

500 kwhr per year used by average de-icer

25 million kwhr per year now being used by de-icers

These devices are long-lived and very few future sales will be for replacement; practically all can be taken as additional load. This indicates an energy use by the end of 1955 of around 50 million kwhr per year.

Electrical Components	Average Price	1951-1955 Market
Heating units, 300—1200 watts..	$3.50	$175,000

Electricity Minimizes Handling Labor

Dayton Power & Light Co

GRINDER saves carting feed to the custom mill

Feed Grinders

Estimates of electricity application as respects feed grinders are extremely difficult to make. The picture is very confused—tractor-drive vs motor drive, big motors for getting the work done quickly vs small motors running for longer times, a man on the job vs automatic operation, hammer mills, roller mills, and burr mills. One reply anticipated growing use of a 5-hp automatic unit now just beginning to gain wide acceptance.

Conclusions from replies:

50,000 electric feed grinders now in use

6,000 sold in 1950

30,000 will be sold, 1951-1955

150 kwhr per year used by average feed grinder

7.5 million kwhr per year now used by feed grinders

A large proportion, say about 50%, of sales in the next 5 years will probably be for replacement of tractor and older motor drives. On this basis, energy use by the end of 1955 will be around 10 million kwhr per year.

Electrical Components	Average Price	1951-1955 Market
Motors ½—10 hp	$175.00	$5,250,000
Starters	20.00	600,000
	Total	$5,850,000

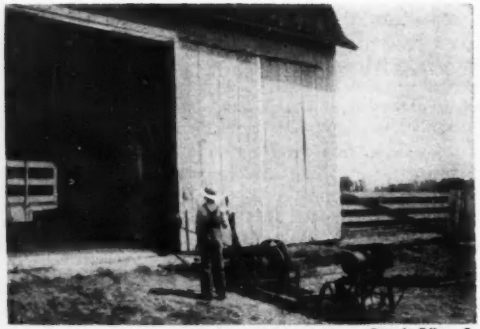
If the automatic feed grinder, noted, really takes hold, this estimate of the 5-year market will be much too low because the automatic machine includes a considerable amount of control equipment and some designs incorporate more than one motor.

Seed and Grain Cleaners

These machines are used to remove dust and chaff from grains; winnowers, they are. There are still a great many of them operated by hand. To drive them with motors does not mean very much in electricity use, but is tremendously important in terms of "Oh, my aching back," the same as with grindstones, a cause of farm boys moving to the city.

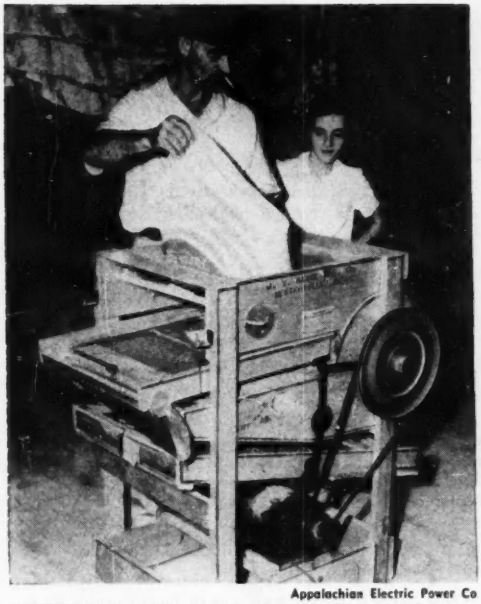
Detroit Edison Co

BARN CLEANER does the dirty work in the cow stable



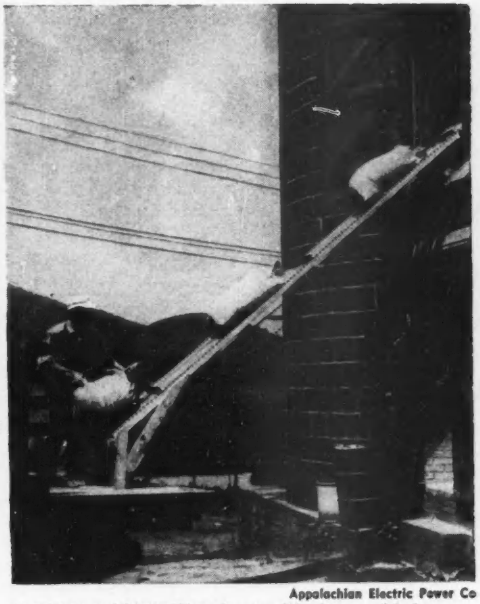
Detroit Edison Co

HAY HOIST frees tractor or team for more hauling



Appalachian Electric Power Co

FASTER CLEANING of seed and grain with motor drive



Appalachian Electric Power Co

PORTABLE CONVEYOR elevator lifts bags and bales

Conclusions from replies:

115,000 seed and grain cleaners in use at end of 1950

8,000 sold in 1950

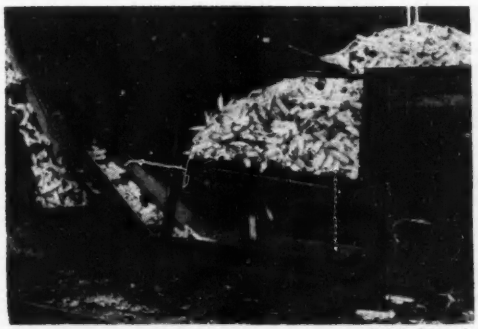
40,000 will be sold, 1951-1955

3 kwhr per year used by average seed and grain cleaner

345,000 kwhr per year now being used by seed and grain cleaners

Energy use at end of 1955 will approximate 450,000 kwhr per year.

Electrical Components	Average Price	1951-1955 Market
Motors, ¼—1 hp.....	$15.00	$600,000
Plugs and cords.....	1.25	50,000
	Total	$650,000



Toledo Edison Co

WAGON UNLOADER speeds crops from field to barn

Portable Conveyor Elevators

This machine is a great labor-saver. It is used for raising and stacking bales of hay and straw, bags of grain, any tied or bagged product.

Conclusions from replies:

200,000 portable elevators now in use

80,000 sold in 1950

400,000 will be sold, 1951-1955

15 kwhr used by average elevator

3 million kwhr per year now used by portable conveyor elevators

Many of these elevators now in use are homemade. In the next 5 years a large proportion of them will be replaced. Assuming that 20% of those sold, 1951-1955, will be replacements results in an energy use at the end of 1955 of 7.8 million kwhr per year.

Electrical Components	Average Price	1951-1955 Market
Motors, ½—3 hp.....	$45.00	$18,000,000
Starters, sometimes included, 200,000 estimated	20.00	4,000,000
Plugs and cords, sometimes included, 300,000 estimated...	1.25	375,000
	Total	$22,375,000

Wagon Unloaders

The wagon is equipped with means for pulling the load to the back—a canvas laid on the floor and pulled back by winding on a roller, or a gate the width of the wagon pulled back by cables. It replaces one or two men and saves much heavy work, as well as much time in moving crops from harvest in the field to storage in barn or crib.

Conclusions from replies:
5,000 wagon unloaders now in use
1,250 sold in 1950
6,500 will be sold, 1951-1955
15 kwhr per year used by an average unloader
75,000 kwhr per year now used by unloaders

This device is a fairly recent commercial product and probably quite a few of those now in use are home-made. Replacement will be rather a factor in the next 5 years. Assuming it will be about 20% results in around 150,000 kwhr per year energy use at the end of 1955.

Electrical Components	Average Price	1951-1955 Market
Motors, ¼—1½ hp.....	$20.00	$130,000
Plugs and Cords.....	1.25	8,125
	Total	$138,125

Hay and Feed Hoists

This device is used to unload hay and other forage crops from the wagon and place them in the mow. An electric hoist frees team or tractor for other work and saves time that may be very important in haying season.

Conclusions from replies:
4,000 electric hoists now in use
300 sold in 1950
1,500 will be sold, 1951-1955
20 kwhr per year used by average hoist
80,000 kwhr per year now used by hoists

It may be assumed that future sales will be mostly for replacement of hoists powered by horses or tractors. This indicates an energy use by this device of about 110,000 kwhr per year by the end of 1955.

Public Service Electric & Gas Co

SILO UNLOADER eliminates the chore of pitching silage

Electrical Components	Average Price	1951-1955 Market
Motors, ¾—5 hp..	$175.00	$262,500
Starters and limit switches, sometimes included, 1,000 estimated....	20.00	20,000
	Total	$282,500

Silo Unloaders

These are a new development, not yet widely accepted. They save the daily chore of climbing up into the silo and pitching the ensilage out.

Conclusions from replies:
5,200 silo unloaders now in use
1,125 sold in 1950
10,000 estimated to be sold, 1951-1955
300 kwhr per year used by average unloader
1.56 million kwhr per year now used by unloaders
4.6 million kwhr per year by end of 1955

Electrical Components	Average Price	1951-1955 Market
Motors, 3—5 hp.....	$180.00	$1,800,000
Starters and time switches, sometimes included, 5,000 estimated.....	20.00	100,000
	Total	$2,912,500

Cup-Type Elevators

These devices are usually permanently installed in granaries and are justified when comparatively large quantities of grain are handled.

Conclusions from replies:
22,000 cup-type elevators in use at end of 1950
2,800 sold in 1950
10,000 will be sold, 1951-1955
15 kwhr per year used by average elevator
330,000 kwhr per year now being used by them

Energy use at end of 1955 will be around 450,000 kwhr per year.

Electrical Components	Average Price	1951-1955 Market
Motors, ½—3 hp.....	$35.00	$350,000

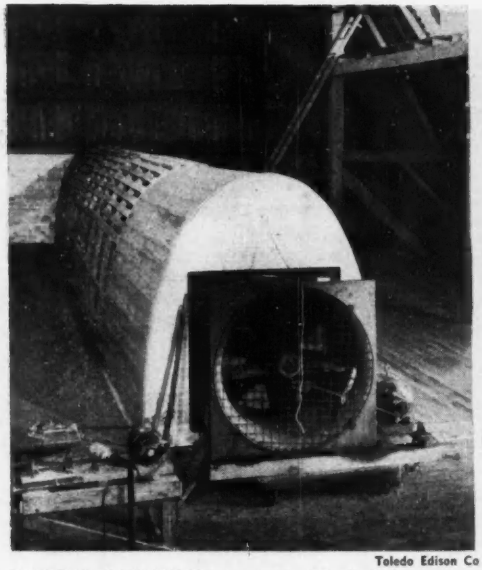
Barn Cleaners

This device is particularly useful on dairy farms. Consisting of a conveyor of some kind or a cable-pulled scoop installed in a gutter running the length of the cow barn, it eliminates much heavy labor in removing manure.

Conclusions from replies:
7,500 barn cleaners now in use
2,750 sold in 1950
15,500 will be sold, 1951-1955
50 kwhr per year used by average barn cleaner
375,000 kwhr per year now used by barn cleaners

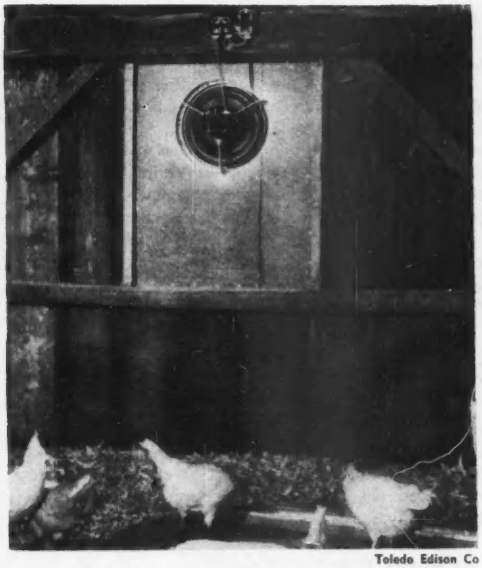
These devices have become a commercial product only quite recently. Probably many future sales will be for replacements, say 20%. This suggests that energy use by the end of 1955 will be about 1 million kwhr per year.

Electrical Components	Average Price	1951-1955 Market
Motors, 1—5 hp.....	$175.00	$2,712,500
Starters and limit switches, sometimes included, 10,000 estimated....	20.00	200,000
	Total	$2,912,000



Toledo Edison Co

HAY CURING SYSTEM conserves nutrients in forage



Toledo Edison Co

VENTILATION makes for healthier poultry and stock

Forced air, for drying and curing root and forage crops, and for ventilation, is a rapidly growing electrical application on the farm

Hay Curing Systems

"Maud Muller on a summer's day was in the meadow raking hay," wrote Tennyson. Modern haymaking presents a very different picture. Instead of lying in the field to be cured by the sun—and, too often, spoiled by the rain—hay can now be stored green in the mow, if necessary, although usual practice is to give it a day or so of field curing. After storage, a motor-driven blower forces air through the hay and drives off just the right amount of moisture. This conserves much more of the nutrient value of the hay than is possible by field drying. A principal reason for this saving is that the hay is much less brittle when it is handled into the mow and loss of leafage is minimized.

Many times farmers have been awakened by the light of dancing flames. Barn on fire! Spontaneous combustion in moldy hay was often the cause. Mow curing reduces this hazard greatly.

Conclusions from the replies:

10,000 hay curing systems now in use

2,000 sold in 1950

15,000 will be sold, 1951-1955

1,500 kwhr per year used by the average hay curing system

15 million kwhr per year now used in hay curing.

Mow curing is only about 15 years old. Its popularity among business-minded farmers is increasing rapidly. Because of this it may be assumed that sales in the next 5 years represent additional load entirely. This results in an energy use of around 38 million kwhr per year by the end of 1955.

Electrical Components	Average Price	1951-1955 Market
Motors, 1—20 hp	$350.00	$5,250,000
Starters	35.00	525,000
	Total	**$5,775,000**

Barn and Poultry House Ventilation Assemblies

Damp, ill-smelling buildings are not conducive to best health of cattle and poultry, not to speak of their unpleasantness and of the moisture hazard to electrical installations. For these and other good reasons, ventilation of farm structures is getting increased attention from wide-awake farmers.

Conclusions from replies:

35,000 ventilation assemblies now in use

6,000 sold in 1950

40,000 will be sold, 1951-1955

500 kwhr per year used by average installation

17.5 million kwhr per year now used by these ventilation assemblies

Because it is not difficult for a farmer to buy a fan or blower and rig up a ventilation system himself, it is probable that the sales estimate for the next 5 years is under, rather than above, the number of new and replacement installations that will be made in that period. This justifies assuming 75,000 installations by the end of 1955 and the use of 37.5 million kwhr per year by them.

Electrical Components	Average Price	1951-1955 Market
Motors, 1/20 — ½ hp.....	$15.00	$600,000
Thermostats	7.50	300,000
	Total	$900,000

Crop Driers

Principal use of these devices is for drying corn that, because of early picking or wet harvest, contains excessive moisture. Heated air is forced through the corn. Recently the drier has been demonstrated as effective for other crops, even root crops like potatoes, and its use is spreading quite rapidly.

Conclusions from the replies:

5,100 crop driers now in use

500 sold in 1950

10,000 will be sold, 1951-1955

500 kwhr per year used by the average drier

2.5 million kwhr per year now used in crop drying

7.5 million kwhr per year by end of 1955

Electrical Components	Average Price	1951-1955 Market
Motors, 3—7½ hp.....	$325.00	$3,250,000
Ignition transformers	7.50	75,000
Over-temperature controls	7.00	70,000
Solenoid valves	8.00	80,000
Flame detectors	7.00	70,000
Starters and switches	38.00	380,000
	Total	$3,925,000

Electric Fence Controllers

It was a great discovery when it was found that a knee-high strand of wire was as effective as a stone wall in keeping a 1,500-lb bull where he belonged. After he had been stung by it once or twice, the bull learned to respect that little wire. The electric fence enables the farmer to use his grazing land to best advantage by keeping the cattle on particular areas while the grass is growing to best value on others.

Conclusions from replies:

1,000,000 electric fence controllers now in use

120,000 sold in 1950

700,000 estimated to be sold, 1951-1955

Only about 25% of controllers are operated from power lines; the rest are run by batteries

100 kwhr per year used by the average non-battery fence

25 million kwhr per year now used by fences

42.5 million kwhr per year used by them at end of 1955

Electrical Components	Average Price	1951-1955 Market
Transformers, condensers, porcelain insulators, rectifiers, etc.....	$5.00	$3,500,000

MILKING was one of the first, and is the largest of all, farm

Electricity Milks the Cows,

Milkers

No other electrical application saves the dairy farmer so much labor and time as does the milking machine. Also he gets more milk and his cows are healthier than with hand milking. With an apparently insatiable national appetite for milk, the market for these machines is an expanding one.

Conclusions from replies:

725,000 electric milkers now in use

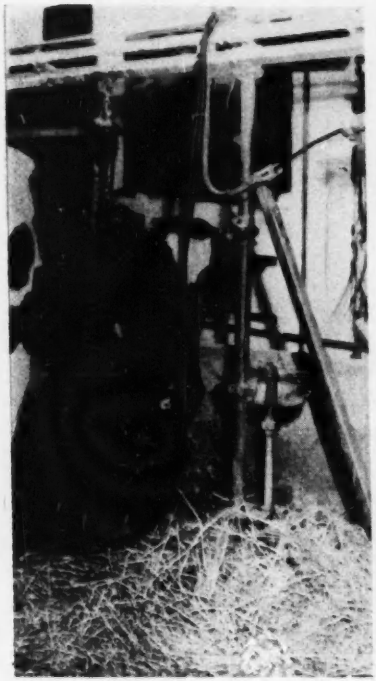
42,500 sold in 1950

255,000 estimated to be sold, 1951-1955

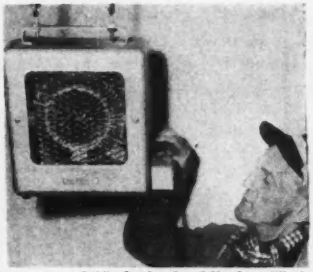
700 kwhr per year used by average milker

507.5 million kwhr per year now used by milkers

Milking machines have been in use for a long time and the factor of replacement cannot be ignored in an estimate of the future market. Say it amounts to 10%. Then the



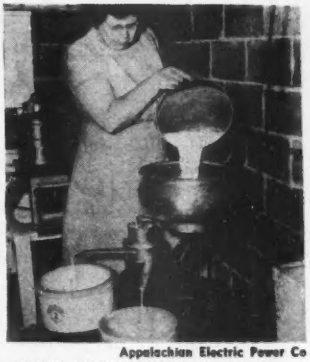
Pennsylvania Power & Light Co
applications of electricity



Public Service Co of Northern Illinois
NO FREEZING in heated milk house

Dayton Power & Light Co
ELECTRICITY LIFTS the milk cans

Public Service Electric & Gas Co
MILK IS COOLED electrically



Appalachian Electric Power Co
CREAM SEPARATED electrically

Cools the Milk and Separates the Cream

use of electricity by milkers at the end of 1955 will be around 650 million kwhr.

Electrical Components	Average Price	1951-1955 Market
Motors, ½—1 hp.....	$45.00	$11,475,000

Milk Can Hoists

This machine prevents strained backs. It lifts the filled milk cans into and out of the cooling tank. The electric device has stiff competition from hoists operated by hand or by vacuum from milking machines.

Conclusions from replies:

2,500 electric hoists now in use
1,000 sold in 1950
3,000 will be sold, 1951-1955
30 kwhr per year used by average hoist
75,000 kwhr per year now used by hoists
150,000 kwhr per year by end of 1955

Electrical Components	Average Price	1951-1955 Market
Motors, ¼—1/3 hp.....	$15.00	$45,000

Included in some units are limit switches, and magnetic brakes may be incorporated in future designs. These are impossible to estimate.

Milk House Heaters

Protection of water pipes from freezing is the reason for heating milk houses. Heaters are of many forms—strip, infrared, air circulators, hot water coils, and condensers of refrigerating units whose first use is for milk cooling. It is a rapidly growing electrical application.

Conclusion from replies:

15,000 milk house heating installations now in use
6,000 sold in 1950
83,000 will be sold, 1951-1955
800 kwhr per year used by average installation
12 million kwhr per year now used

Some few of the sales in the next 5 years, say about 10%, will be for replacement. This indicates an energy use of approximately 72 million kwhr per year by the end of 1955.

Electrical Components	Average Price	1951-1955 Market
Heating units, 1,200—3,000 watts	$5.00	$415,000
Thermostats	7.50	622,500
	Total	$1,037,500

Sometimes small, fan-type motors are included in these devices, but their value is impossible to estimate.

Cream Separators

It has been many years since cream was skimmed off the milk pans in the spring house. About one of every five farms now has a separator. Many of the older hand-cranked machines are still in use, but most of them on farms with electric service have been equipped with motors.

Conclusions from replies:

1,000,000 separators now in use
38,700 sold in 1950
200,000 estimated to be sold, 1951-1955
90 kwhr per year used by average separator
90 million kwhr per year now used by separators
108 million kwhr per year by end of 1955

Electrical Components	Average Price	1951-1955 Market
Motors, 1/6-1/4 hp	$15.00	$3,000,000

Milk Coolers

To reduce propagation of bacteria, milk should be cooled as quickly as possible after coming from the cow. Since bacteria count is a determinant of milk value, this is a growing application of electrical refrigeration.

Conclusions from replies:

325,000 milk coolers now in use
35,000 sold in 1950
200,000 will be sold, 1951-1955
1,500 kwhr per year used by average cooler
488 million kwhr per year now used by milk coolers

Some of the milk coolers sold in the next 5 years, say 20%, will be for replacement. This indicates an energy use of about 730 million kwhr per year at the end of 1955.

Electrical Components	Average Price	1951-1955 Market
Refrigeration Units, 2—20 cans	$225.00	$45,000,000

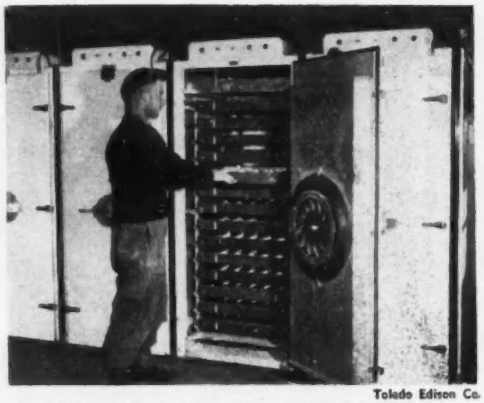
Milk Utensil Sterilizers

There is available a dry heat electric sterilizer for this use, but the survey response did not cover this kind, only the open-type water heater. This device is being superseded by the closed-tank storage heater which is also used in household service and is impossible of appraisal as a piece of farm production equipment. The data here thus apply only to the open tank heater and, probably are too high for this one device. But in default of better they may be taken as representing the whole field.

Conclusions from replies:

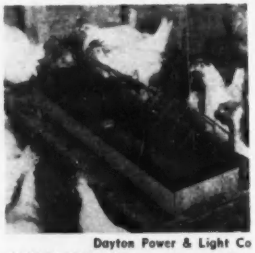
250,000 sterilizers now in use
40,000 sold in 1950
175,000 estimated to be sold, 1951-1955
1,400 kwhr per year used by average sterilizer
350 million kwhr per year now used by sterilizers
595 million kwhr per year by end of 1955

Electrical Components	Average Price	1951-1955 Market
Heating units, 500—1,000 watts	$3.50	$612,500
Thermostats	2.00	350,000
Plugs and cords	1.25	218,000
	Total	$1,181,250



Toledo Edison Co.

CLEANER, safer hatching heat in electric incubator



Dayton Power & Light Co

CHICKENS like warm water

Detroit Edison Co.

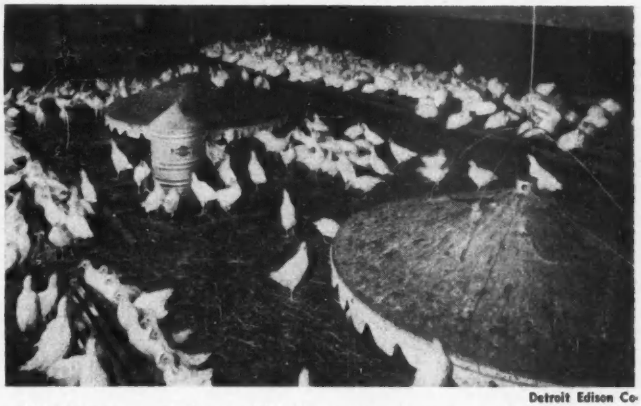
AUTOMATIC poultry feeder—plenty to eat, no waste

Pennsylvania Power & Light Co

GRADED EGGS bring better prices to the poultryman

Appalachian Electric Power Co

LINEAL HEATERS find many uses



Detroit Edison Co

BROODERS may be hovers like these, cabinets, or suspended heat lamps

Poultry Farms Use Electricity Profitably

Incubators

While the business volume of commercial hatcheries is steadily increasing, there are still many poultrymen and other farmers who operate incubators and will continue to do so, although probably in slowly decreasing numbers.

Conclusions from replies:

200,000 small electric incubators now in use
13,000 sold in 1950
40,000 estimated to be sold, 1951-1955
70 kwhr per year used by average incubator
14 million kwhr per year now used by incubators

The number of poultrymen buying chicks from hatcheries may conceivably cancel out the number of sales of small incubators in the next 5 years, thus leaving little or no net gain in number in use. On this reasoning, an energy use of around 15 million kwhr per year at the end of 1955 is indicated.

Electrical Components	Average Price	1951-1955 Market
Heating units, 100 watts.....	$1.00	$40,000
Thermostats	2.50	100,000
Cords and plugs.....	1.25	50,000
	Total	$190,000

Electric Poultry Brooders

Few chicks these days can recall infancy spent in the cozy shelter of the wings of a brooding hen. Probably about 20% of the brooders now in use are electric.

Conclusions from replies:

900,000 electric brooders now in use
100,000 sold in 1950
500,000 will be sold, 1951-1955
300 kwhr per year used by average brooder
270 million kwhr now used by brooders

Replacement of complete brooders is not seen as a significant part of the market in the next 5 years. Therefore, an expectation of 420 million kwhr used for brooding by the end of 1955 is not unreasonable.

Electrical Components	Average Price	1951-1955 Market
Heating units, 150—1,000 watts..	$3.00	$1,500,000

Impossible to estimate are thermostats, fans, and attraction lights incorporated in some brooders.

This estimate is for the commercial product only; it does not take into account brooders assembled by users.

Poultry Water Warmers

Tests have shown that hens will produce 10 to 20% more eggs in the winter months if their drinking water is warmed to 50 deg F and kept there than if it is allowed to get cold and probably to freeze over.

Conclusions from replies:

1.3 million poultry water warmers now in use
100,000 sold in 1950
500,000 will be sold, 1951-1955
60 kwhr per year used by average water warmer
78 million kwhr per year now used by warmers
108 million kwhr per year used by them at end of 1955

Electrical Components	Average Price	1951-1955 Market
Heating units, 50—150 watts.....	$2.00	$1,000,000
Thermostats	2.00	1,000,000
	Total	$2,000,000

Automatic Poultry Feeders

These machines are hopper and conveyor assemblies that deliver feed to flocks of chicks and laying hens. They work on preset timing and reduce wastage of feed, compared with hand feeding. Their use is growing rapidly.

Conclusions from replies:

6,000 automatic poultry feeders now in use
5,000 sold in 1950

40,000 will be sold, 1951-1955
450 kwhr per year used by average feeder
2.7 million kwhr per year now used by feeders

A comparatively new development, there has not been time for a replacement market for feeders to arise. Thus sales in the next 5 years may be taken as representing additional load. On this assumption, feeders will be using 20.7 million kwhr per year at the end of 1955.

Electrical Components	Average Price	1951-1955 Market
Motors, ¼—1 hp	$35.00	$1,400,000
Time switch	10.00	400,000
	Total	$1,800,000

No estimates can be made of overload and other controls included in some designs.

Egg Cleaners (Dry)

These machines are available in two forms—hand-operated that clean one egg at a time, and automatic that handle 6 to 36 eggs simultaneously.

Conclusions from replies:
700 dry egg cleaners now in use
70 sold in 1950
800 estimated to be sold, 1951-1955
300 kwhr per year used by average cleaner
210,000 kwhr per year now used by cleaners
450,000 kwhr per year by end of 1955

Electrical Components	Average Price	1951-1955 Market
Motors, 1/30—1/3 hp	$15.00	$12,000
Plugs and cords	1.25	1,000
	Total	$13,000

Egg Graders

Larger and heavier eggs bring better prices than smaller ones. So the enterprising poultryman sorts them out, and faster and more accurately with a grader than by hand.

Conclusions from replies:
5,400 egg graders now in use
700 sold in 1950
3,300 will be sold, 1951-1955
45 kwhr per year used by average grader
243,000 kwhr per year now used by egg graders
380,000 kwhr per year used by end of 1955

Electrical Components	Average Price	1951-1955 Market
Motors, ¼—1/3 hp	$20.00	$66,000

Lineal Heaters

Included here are soil-heating cable and heating tape. These products are versatile in their applications and new uses for them are continually popping up. They keep pipes from freezing, brood chicks, force plant growth, do almost anything that requires flexible application of heat.

Conclusions from replies:
25 million feet in use at end of 1950
7.5 million feet sold in 1950
50 million feet estimated to be sold, 1951-1955
0.5 kwhr per year average use per foot
17.5 million kwhr per year now used by lineal heaters
42.5 million kwhr per year by end of 1955

Electrical Components	Average Price	1951-1955 Market
Heating cable and tape	15¢/ft	$7,500,000

ACKNOWLEDGMENT

Electrical World and the National Electrical Manufacturers Association thank the following makers of farm electric equipment for data and other help in this farm electrification study:

AEROVENT FAN & EQUIPMENT, INC
Lansing, Mich.
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Crystal Lake, Ill.
AMERICAN MACHINE & METALS, INC
East Moline, Ill.
BARNES MFG CO
Mansfield, Ohio
THE BELT CORP
Orient, Ohio
THE BUCKEYE INCUBATOR CO
Springfield, Ohio
BYRON JACKSON CO
Los Angeles, Calif.
CALF-TERIA SALES INC
Fort Wayne, Ind.
CARROLL IMPLEMENT & MFG CORP
Carroll, Ohio
CASTLE HILLS CORP
Piqua, Ohio
CLAY EQUIPMENT CORP
Cedar Falls, Iowa
THE DAYTON PUMP & MFG CO
Dayton, Ohio
DEMPSTER MILL MFG CO
Beatrice, Neb.
ELECTROMODE CORP
Rochester, N. Y.
FAIRBANKS, MORSE & CO
Chicago, Ill.
A. J. FERRELL & CO
Saginaw, Mich.
THE FLINCHBAUGH CO
York, Pa.
FLINT & WALLING MFG CO
Kendallville, Ind.
FRIGIDAIRE DIV, GENERAL MOTORS CORP
Dayton, Ohio
GEHL BROS MFG CO
West Bend, Wis.
GOULDS PUMPS, INC
Seneca Falls, N. Y.
GRAND SHEET METAL PRODUCTS CO
Chicago, Ill.
J. W. HANCE MFG CO
Westerville, Ohio
HANDY APPLIANCE MFG CO
Albertville, Ala.
HEDLUND MFG. CO
Boyceville, Wis.
INTERNATIONAL HARVESTER CO
Chicago, Ill.
KEYSTATE MFG CO
Lewistown, Pa.
LEACH CO
Oshkosh, Wis.
THE LETZ MFG CO
Crown Point, Ind.
THE LOUDEN MACHINERY CO
Fairfield, Iowa
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Macomb, Ill.
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Ashland, Ohio
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Renton, Wash.
OTTO NIEDERER & SONS CO
Titusville, N. J.
THE OAKES MFG CO
Tipton, Ind.
PAUL PUMPS,, INC
Fort Wayne, Ind.
PEERLESS PUMP DIV, FOOD MACHINERY & CHEMICAL CORP
Indianapolis, Ind.
THE PRIME MFG CO
Milwaukee, Wis.
RED JACKET MFG CO
Davenport, Iowa
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TRIANGLE MFG CO
Detroit, Mich.
UNIVERSAL MFG CO
Berkeley, Calif.
VICTOR PRODUCTS CORP
Hagerstown, Md.
WARNER BROODER & APPLIANCE CO
North Manchester, Ind.
WESTINGHOUSE ELECTRIC CORP
Pittsburgh, Pa.
WORTHINGTON PUMP & MACHINERY CORP
Harrison, N. J.

Ready for today's great power expansion

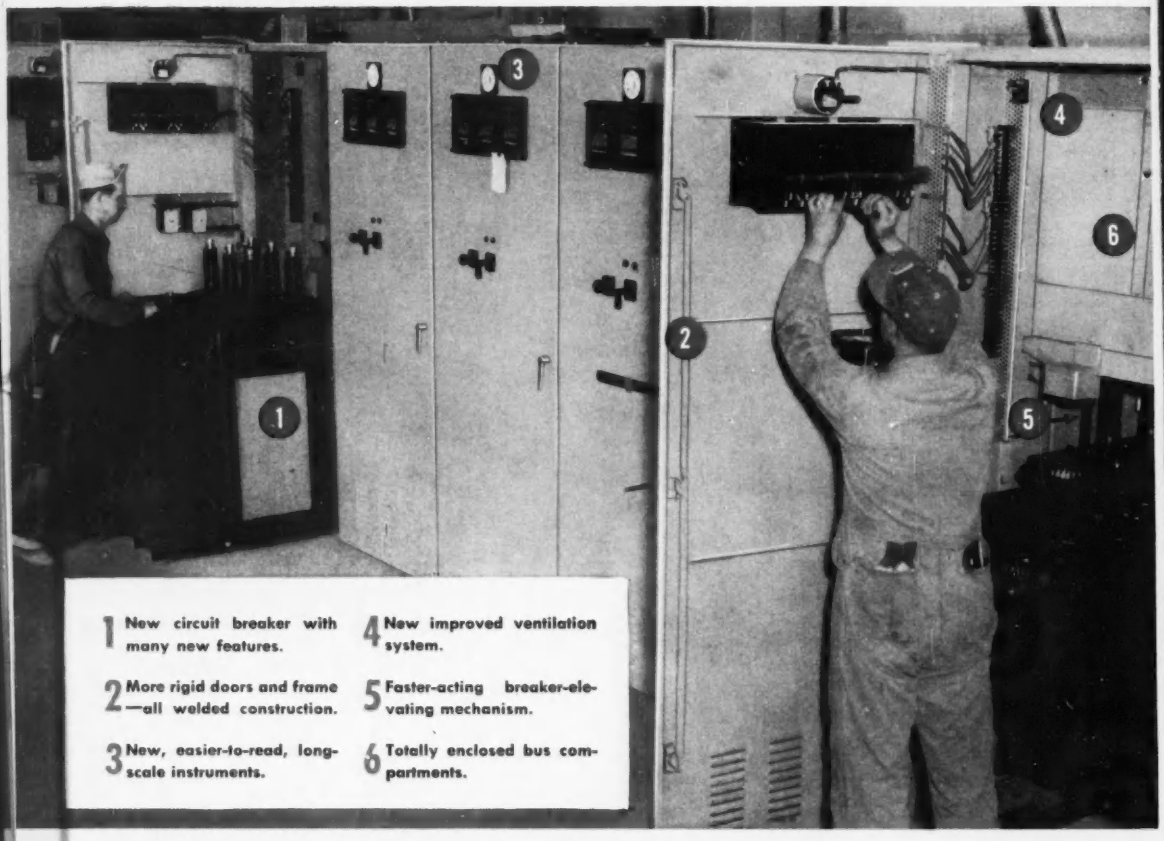
IMPROVED G-E METAL-CLAD SWITCHGEAR

...matched to today's greater "on the job" requirements, and meeting all industry standards.

Already delivered to one of America's largest and newest industrial plants, this improved G-E Metal-clad Switchgear will assure dependable power for a mammoth production job. In the foreground are the 13.8-kv G-E magne-blast circuit breakers for the Metal-clad equipments being installed.

GENERAL ELECTRIC

Improved G-E Metal-clad Switchgear


1 New circuit breaker with many new features.
2 More rigid doors and frame—all welded construction.
3 New, easier-to-read, long-scale instruments.
4 New improved ventilation system.
5 Faster-acting breaker-elevating mechanism.
6 Totally enclosed bus compartments.

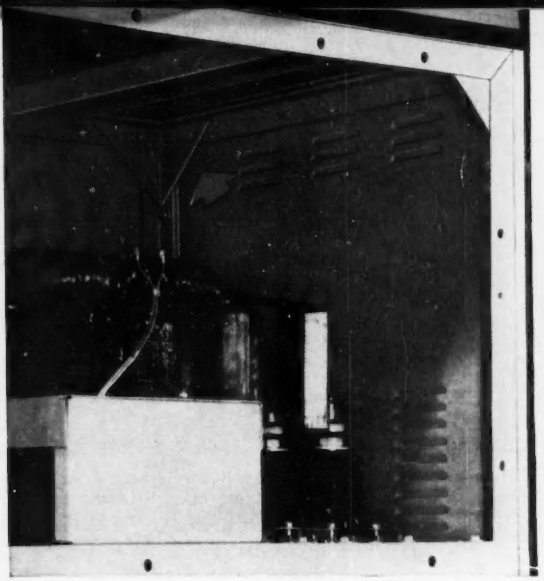
Stronger! Safer! A Wealth of New Features That Contribute to More Dependable Operation!

Pioneered by General Electric in 1935, Metal-clad Switchgear has set new standards of safety and dependability that have made it the accepted power distribution equipment throughout all industry.

Now, with new pace-setting advances in design and construction, it's better than ever, and still maintains the features of visible primary contacts when breaker is lowered to the disconnect position.

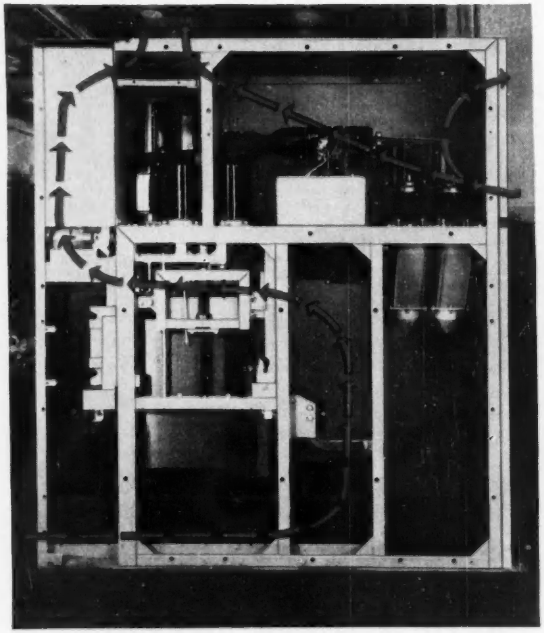
With expanding production schedules calling for more and more electric power, improved G-E Metal-clad Switchgear, in 4.16 kv and 13.8 kv ratings, gives the greatest protection against electrical shut-downs. New advanced features simplify operation and inspection, and provide increased safety for personnel. And with stronger, more rigid construction and simplified design of many components, you get even more dependability.

Only a few of the many new features can be shown here. For full information, see your local G-E Apparatus Sales representative, or write for Bulletin GEA-5664, General Electric Company, Schenectady 5, N. Y.

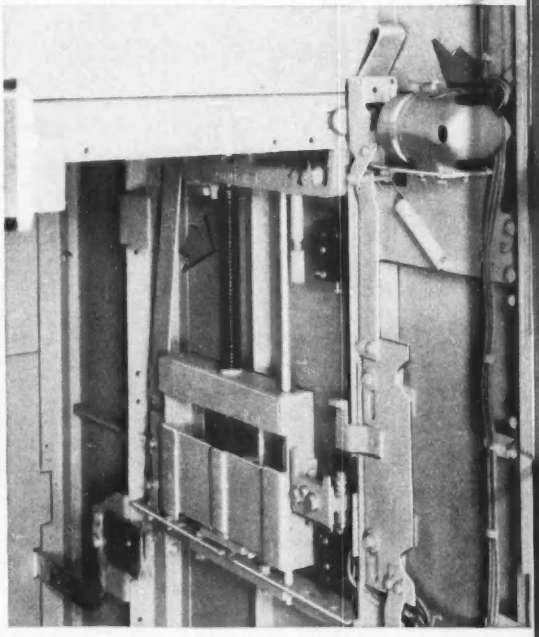


FRAME NOW COMPLETELY WELDED into one solid unit. Gusseted corners (see arrow) provide greater rigidity. Doors have a three-point latch operated from a single handle, and are reinforced against warping by a steel tube at hinge side.

REMOVABLE MAGNE-BLAST CIRCUIT BREAKER features improved flame-retardant insulation and simplified contact design. Breaker operating mechanism and control relay are on the front of breaker for easy accessibility.

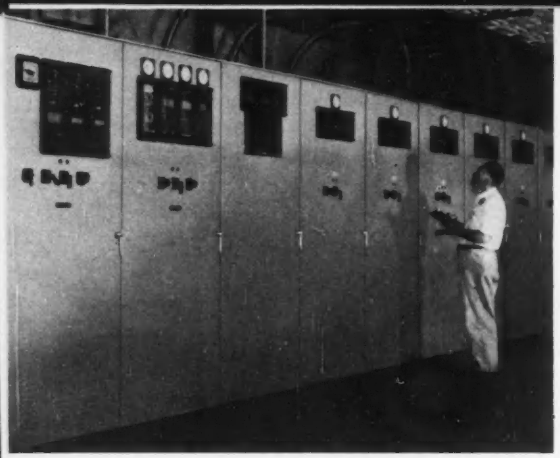


IMPROVED VENTILATING SYSTEM: Arrows show natural draft of air that constantly ventilates entire switchgear unit. The totally enclosed bus compartment, at upper left, is cooled by the circulation of air around it.

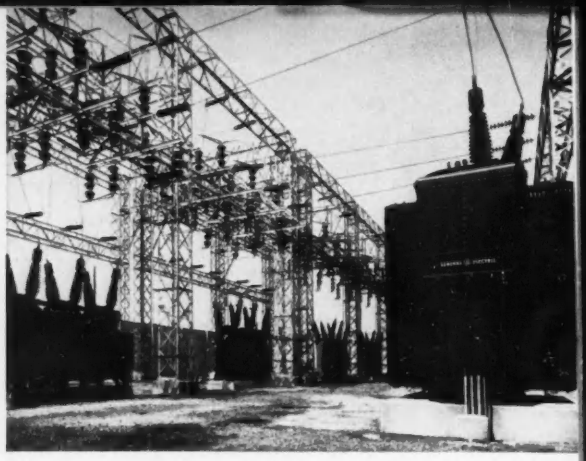


NEW FASTER ACTING BREAKER ELEVATING MECHANISM can raise the removable circuit breaker into position, or lower it for testing, in 30 seconds. A new compact gear-motor drives the simplified jack screw elevating mechanism.

GENERAL ELECTRIC



IMPROVED G-E METAL-CLAD SWITCHGEAR shown installed in new plant. Adequate interrupting capacity of circuit breakers plus total enclosure of all live parts insures maximum protection against electrical failures.



G-E OUTDOOR SUBSTATION built from standardized units, including transformer, oil circuit breakers and steel structure. Use of this equipment enabled this plant to save months in planning and installation.

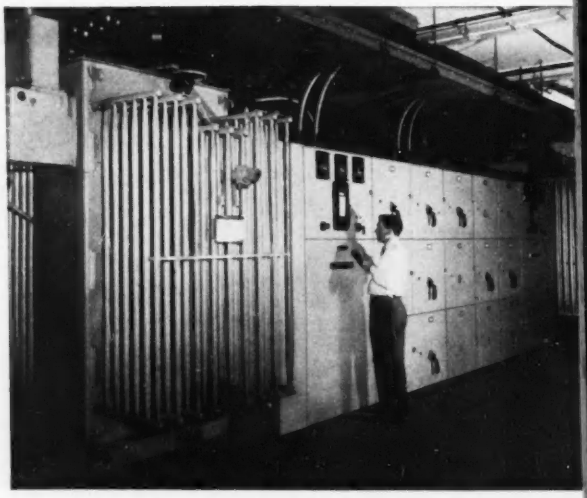
Complete Electrical System from "Packaged" equipment

...Here's the modern trend made possible with G-E equipment

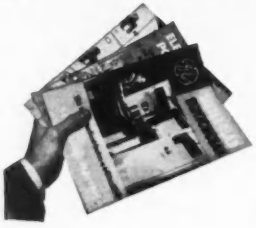
General Electric Vertical-lift Metal-clad Switchgear is only one item in a complete line of factory-assembled "packaged" equipment designed to simplify planning and speed installation of the safe, modern electrical systems required for today's expanding production.

The trend to "packaged" electrical equipment throughout the installation is illustrated by the examples shown on this page. Installed in one of the nation's newest and largest plants, each item of equipment was supplied as a ready-to-use unit. Use of standardized "packaged" equipment enabled this plant to get into production in record time.

Perhaps similar equipment can help you. General Electric engineers stand ready to assist you in solving your particular problems. General Electric Co., Schenectady 5, N. Y.



METAL-ENCLOSED LOAD-CENTER UNIT SUBSTATION, delivered as a "package," supplies low-voltage power to adjacent machines—eliminates need for long, low-voltage feeder system. Unit shown is one of 18 installed in this plant.



Complete data at your finger tips—Write for these helpful bulletins

Full information on modernizing or expanding your electrical system with G-E packaged equipment is given in these three illustrated booklets. Write for GEA-5664 "G-E Metal-clad Switchgear," GEA-3592 "Load-center Unit Substations" and GEA-5600 "Power for Industry's Third and Biggest Expansion."

GENERAL ELECTRIC

854-42

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Reduce Fire Losses with Adequate Protection

Damage due to transformer fires can be eliminated or greatly reduced by observing the following precautions outlined in the Fire Manual for Public Utilities, prepared by Marsh & McLennan of Chicago.

Indoor Installations

1. Transformers installed indoors should be located so they will not endanger other equipment by spreading oil, by internal explosions, or by uncontrolled fires.

2. Indoor transformers with an oil capacity greater than 500 gallons should be enclosed in a fire resistant compartment. Door sills should be high enough to confine all the oil that might escape from the largest single unit. Suitable ventilation and ample drainage to the outside should be provided.

Oil dikes at least four inches in height should be placed around unsealed cable ways or conduits to prevent oil from reaching other sections of the building.

3. Transformers should be individually drained. If connected with a single header, it should be capable of relieving the total oil capacity in less than ten minutes, and have a quick acting valve operated from outside the enclosed room. Individual valves for each transformer, connected with the header, should be left open during normal operation.

Outdoor Installations

4. Outdoor transformers should be segregated with barriers and provided with oil dikes and gravel drainage areas to confine oil and direct it to a safe place.

5. Oil should be tested and filtered periodically to determine dielectric strength, remove moisture and foreign material.

6. Non-inflammable oil should be used where it can be proven economically possible to do so.

TRANSFORMER FIRE EXTINGUISHED in two seconds with dry chemical from a 20 lb portable extinguisher. Adequate protection reduces fire loss

7. Automatic or manually controlled carbon dioxide extinguishing equipment, fog nozzle, or other automatic water protection is recommended as a further safeguard for large oil transformers.

8. Oil temperature should be tested at full load at least once a month. Prompt action should be taken if the oil temperature exceeds 90 C.

9. Air cooled transformers, in addition to being isolated from other equipment, should be supplied with air through incombustible ducts. A common draft tube should only be used when drop shutter permits shutting off air to any single transformer without interfering with flow to the other units.

10. Water cooled transformer piping connections should be inspected systematically to prevent the possibility of water entering casings.

11. Megger tests should be made periodically to determine the condition of the insulation.

12. Fencing should be erected, to reduce accidental short circuits.

13. Relay protection to automatically disconnect the transformer from service in case of fire or electrical disturbance is essential.

14. Fire fighting facilities are needed to insure protection. Some means of relaying trouble alarms should be provided so that the control operator can dispatch repairmen to the location of the fire.

SUCKERS grew readily from a stump covered by a blanket of snow before chemical treatment could be applied. Right-of-way was cleared in January, 1950; photo was taken in April, 1951

DEAD STUMP resulted from treatment with ammonium sulfamate. Under same growing conditions as stump in illustration opposite, treated stump shows no indication of sprouting

Chemical Stump Treatment Controls Sucker Growth

A. B. STITT
Forester
Northern States Power Co,
Minneapolis, Minn.

Ammonium sulphamate has been used very successfully by Northern States Power Co for the control of sucker growth from stumps along transmission and distribution lines. At present it is being used exclusively for the treatment of fresh-cut stumps. Ammonium sulphamate has been used in three different methods:

1. Laying the dry powder in notches which have been cut around the base of the stump.

2. Using a concentrated liquid mixture on the cut surface of stump.

3. Encircling the cut surface, to include all of the sapwood, with a thin layer of dry powder.

Of these methods the third is preferred because it is more easily done. However, stumps cut higher than about 2 ft from the ground should have the auxiliary treatment of notches close to the ground for effective control. The difficulty with the second method is the complication of mixing and storing in non-corrosive containers. Also, it is difficult to retain the mixture on cut surfaces which are not level.

Ammonium sulphamate is used on a year around basis for controlling or killing stumps. It is equally effective when used during the winter as during other times of the year.

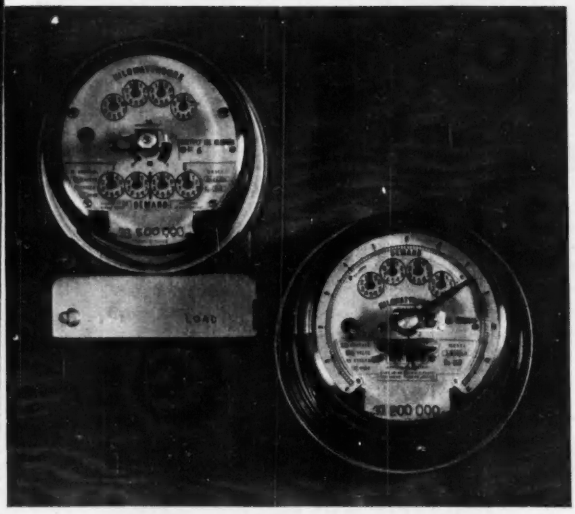
Application of ammonium sulphamate the same day as cutting is desirable but it has been found that there is no serious objection to several days delay. However, stumps covered by a blanket of snow before treatment show up readily the following summer with prolific amounts of sucker growth.

Ammonium sulphamate appears to do a remarkable job of killing the stump and root system, thereby eliminating future growth. No abnormal decay or breakdown of the woody structure has been observed over a few years of experience, other than the normal reaction one would expect in a dead stump.

Cook Electrically for Field Forces

CONSTRUCTION CAMP KITCHEN designed by Los Angeles Dept of Water and Power prepares 1,200 meals daily for workers on their Owens Gorge project. Range, roasting oven, walk-in refrigerator and 16 other major appliances are electric. Use of electric equipment speeds production line layout and reduces labor

Announcing IM-50 Watthour Demand Meters



NEW IM-50 METERS are available for socket or front connections. They can be used on circuits where voltage is either 10% above or below rated meter voltage. Registers are available separately.

New single-phase meters now available with indicating or cumulative registers

General Electric's I-50 meter line has been extended to include the IM-50 watthour demand meter. Primary applications are for small commercial and industrial loads.

WITH M-30 INDICATING REGISTERS, you are assured of positive reset by Geneva action . . . with no shock. These registers have a long, 9½-inch scale. There are no springs, latches, or governors. Reset load on the motor is low . . . and motor life is long. This unit, with a minimum number of parts, provides maximum flexibility for all indicating demand measurements.

WITH M-31 CUMULATIVE REGISTERS, these meters provide an indication of maximum demand plus the cumulative value of previous maximum demands.

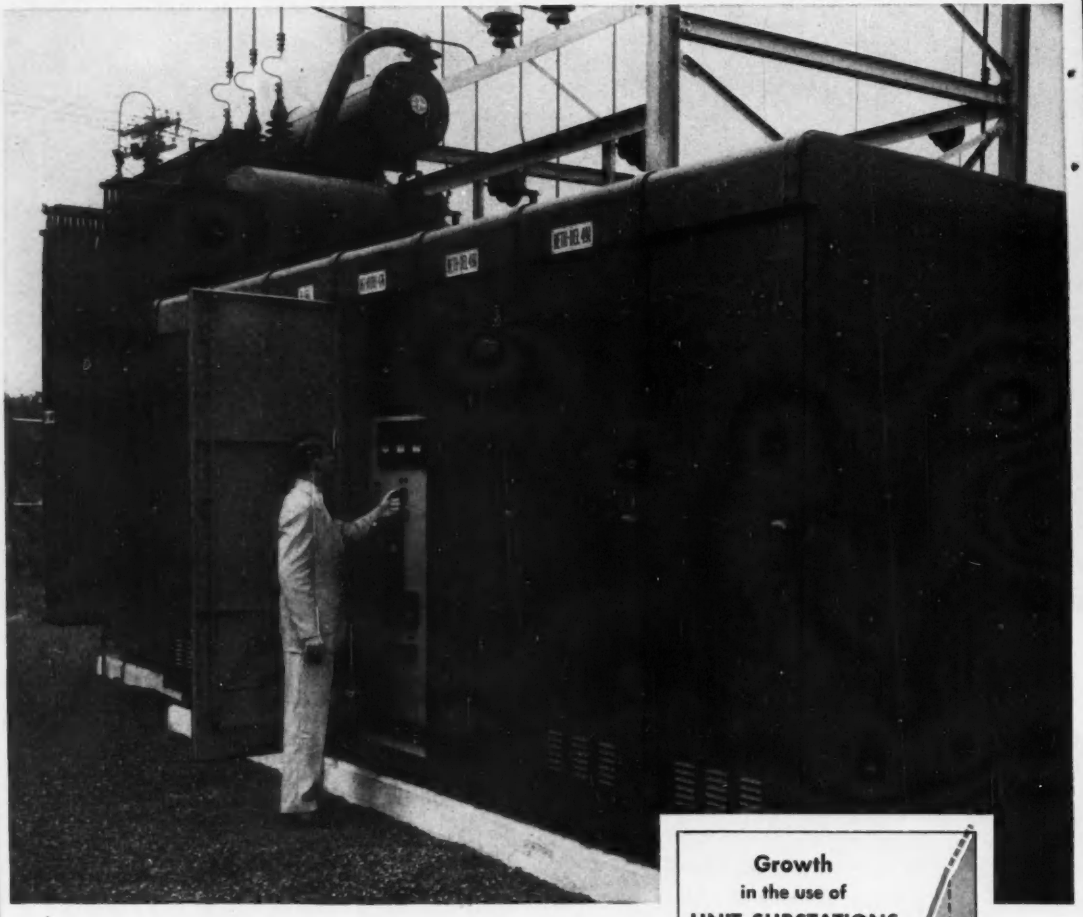
All construction features of I-50 watthour meters are also included . . . magnetic suspension, butyl and polyethylene insulation, and others.

For more information, contact your G-E representative or write Section 601-52, General Electric, Schenectady 5, N. Y.

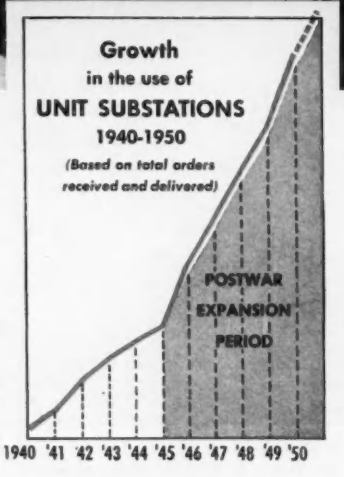
GENERAL ELECTRIC

601-32

Niagara Mohawk EXPANDS FAST at



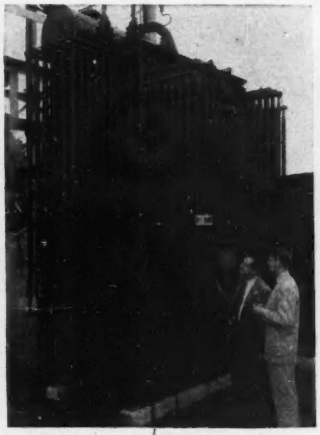
NIAGARA MOHAWK ADDS 10,000 quickly and easily with third and fourth G-E master unit substations (5000 kva each). The one above transforms 33 kv to 5.04 kv. Open compartment door shows operating panel for magne-blast breaker. More details in photos on opposite page.


Growth
in the use of
UNIT SUBSTATIONS
1940-1950
(Based on total orders received and delivered)
POSTWAR EXPANSION PERIOD
1940 '41 '42 '43 '44 '45 '46 '47 '48 '49 '50

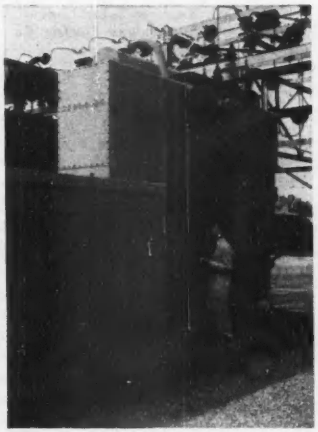
WHAT DOES THIS TREND MEAN? Savings in time, money and materials are becoming more and more important. It also means that adaptable compact unit substations have proved to be perfectly suited in cases where "special designs" were thought necessary. You get plenty of flexibility when you use G-E packaged substations.

low cost—with G-E Unit Substations

CIRCUIT BREAKERS are safely and easily removed for inspection. This view shows rear of Niagara Mohawk's new G-E metal-clad transformer main breaker in operating position. Breaker cannot be lowered for removal until it is tripped and power circuit interrupted.



YEARS OF MAINTENANCE-FREE SERVICE ahead for transformers in Niagara Mohawk's new unit substation. Bus regulation of voltage is provided by load-ratio-control equipment. Experience shows G-E LRC equipment requires very little maintenance.



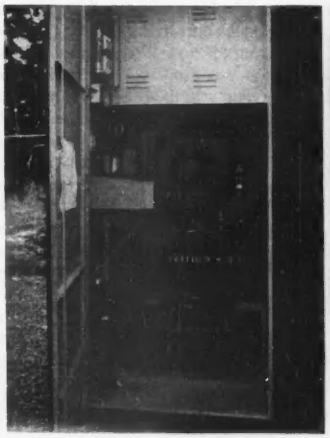
FORESIGHT PAYS OFF again and again. Above is section of older G-E master unit substation installed by Niagara Mohawk in 1939. Growing loads posed no problem—new unit (barely visible, upper left) installed alongside, capacity increased by 5000 kva.

Quick, easy ordering and installation help Niagara Mohawk expand fast to meet increased demand in Albany area

Like many other utilities and industrial plants, Niagara Mohawk Power Corp. has shown it pays to use "packaged" power equipment. In this locality, they've chosen a standard distribution system (in this case: primary network) and a standard load increment, or "building block" of power (5000-kva). As load grows, a duplicate substation of this capacity is tied into the system, always a jump ahead of demand.

A G-E unit substation arrives ready for use—you simply spot in place, connect, and energize. You save not only on equipment and installation costs, but also valuable engineering time to use for over-all planning.

These are just a few reasons for the fast-growing trend to unit substations shown in the chart on the opposite page. Your local G-E representative can show you plenty of others. Call or write him. *General Electric Company, Schenectady 5, N. Y.*



EXTRA $5000 SAVED BECAUSE OF FLEXIBILITY

IDEA TO SAVE MONEY: Photo above is close-up of G-E metal-clad auxiliary compartment, installed with rest of Unit Substation. Flexibility permitted Niagara Mohawk to install 48-volt battery, charger, telephone. By doing this instead of using special construction, Niagara Mohawk estimates they saved $5000 to $8000.

321-80

GENERAL ELECTRIC

Mobile Substation Is Effective During Station Maintenance

C. D. HIGHLEYMAN
Asst. Supt. of Substations
Indiana & Michigan Electric Co
South Bend, Indiana

Four year's experience with a 3,000-kva mobile substation has demonstrated its value during construction and maintenance at stations where service must be maintained, and for increasing station capacity temporarily while permanent additions are made. We apply our mobile station primarily to cases where short-time service will be required so the unit will be available for emergency service. It often can restore service under most conditions faster than other means.

The unit has a multi-tap transformer rated 3,000-kva with forced-oil, forced-air cooling. Voltages of 25,482 v to 35,300 v are available in 10 steps on the high-voltage side through externally operated tap adjusters. This large voltage range is necessary because this operating division has both 33-kv and 27.6-kv nominal voltage levels. Low-voltage winding is tapped for 2400/4160Y/7200/12,408Y voltages, which are also available through externally operated switches.

From 1946 to 1950 the mobile substation was used in 30 separate locations and travelled 1,220 miles. Actual service hours have totalled 5175, while time in transit and connecting and disconnecting time amounted to 362 hr. Total usage in 4 years was 5,537 hr, giving a use factor of almost 16%. However, it should be remembered that with spare units or emergency equipment, hours of usage is not always the best index of value.

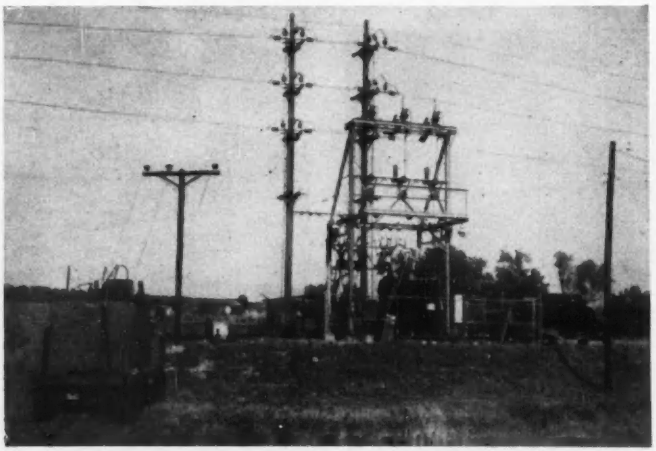
Use of the mobile unit has made possible the 30 operations shown in the table. Conclusions have been drawn based on the applications including the preparations necessary to placing the substation in service.

1. It may appear that use of the mobile unit can be justified only on major work, if considered solely on an investment-return basis. However, if a job requires several days normal service outage, or if the use of the mobile unit eliminates several premium-time work days, use of the unit is economical.

2. Where minor work is to be done requiring up to 6 or 8 hr, and a service interruption is permissible, use of the mobile substation is not economically justified even if the work has to be done during overtime hours. However, if an interruption cannot be arranged, use of the mobile unit is the only answer.

Use of Mobile Substation Permitted These Operations

	Times Performed
Increase Permanent Station Transformer Capacity	17
Paint Station Structures and Equipment	7
Construction in Stations without Transformer Change	6
Emergencies	0



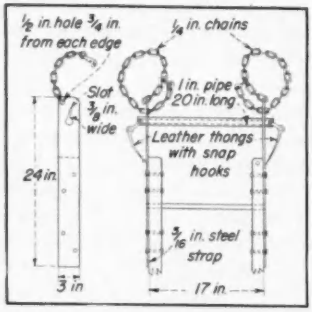
MOBILE SUBSTATION replaced Lydick substation during a transformer change. Fence was not necessary around mobile unit because it was energized only one day in a remote area where it could be guarded by construction personnel

Safety Chain For Transmission Ladders

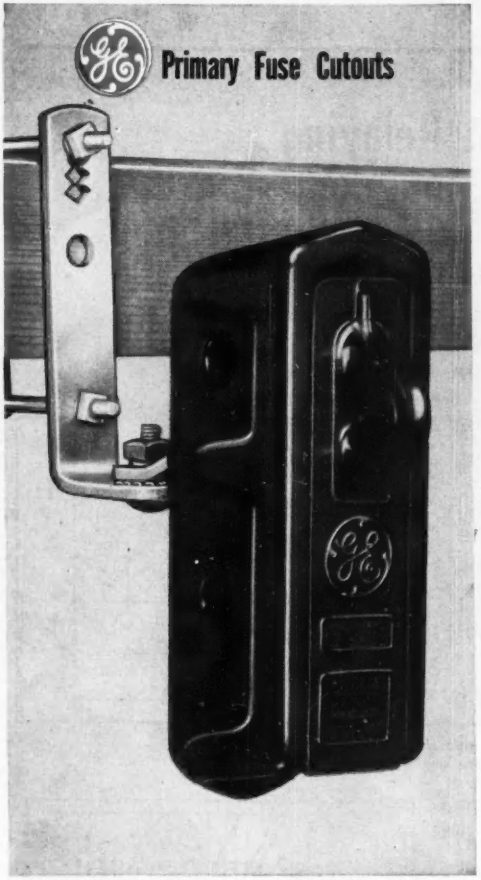
A. L. STONE
New England Power Co
Shelburne Falls, Mass.

A safety-chain ladder attachment which replaces the usual hook type has been developed by the New England Power Co for use where more than one type of standard hook ladder is needed on transmission rights-of-way. Weight of a ladder with the safety chain attachment is somewhat less than the weight of a ladder equipped with the usual type of hook. In addition, there is less difficulty in carrying a ladder and chain attachment over rough terrain.

In use, the chains are first put around the tower steel or wood of "pole-arm" structures. Then they are brought through 1½-in. holes in the steel straps attached to the side rails of the ladder. After adjustment to the correct length, a link is inserted in the slot and a pipe is put through the hole to secure the link. A leather thong and snap hook, which keeps the pipe in place, is made just long enough so that only one side need be disconnected for withdrawal of the pipe.


½ in. hole ¾ in. from each edge
¼ in. chains
Slot ⅜ in. wide
1 in. pipe 20 in. long
Leather thongs with snap hooks
24 in.
⅜ in. steel strap
3 in
17 in.

SAFETY CHAINS with snap attachments hold ladder in place on transmission structures. Attachment is for ladder with wooden frame 15 ft long



This cutout is liberally designed—has high dielectric strength, uses silver-plated contacts, provides full-range interruption of fault currents, and is conservatively rated as to interrupting capacity. All live parts are completely enclosed for maximum safety.

4 CUTOUTS IN ONE

by simply changing doors

AND THAT'S ONLY HALF THE STORY! By stocking only three interchangeable doors which fit both 5.2 and 7.8 kv, 50-ampere housings, you get the 4 operating functions illustrated below—a total of eight essential cutout combinations! Available also in 100-ampere ratings, this unique flexibility reduces inventory and simplifies stocks.

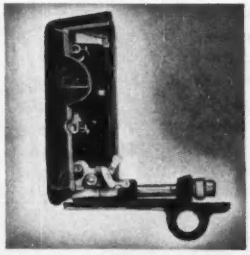
INDICATING OR DROPOUT WITH A TWIST OF THE WRIST! A small wire yoke, easily inserted or removed, determines whether the fuseholder door "kicks out" at the bottom for visual indication, or drops open—either way giving positive evidence of a blown fuse.

RECLOSING DOOR AVOIDS UNNECESSARY SERVICE TRIP! The two-element reclosing door restores service within one second after a temporary fault blows the first fuse link. By avoiding an extra service trip, the two-shot cutout pays for itself the first time it operates!

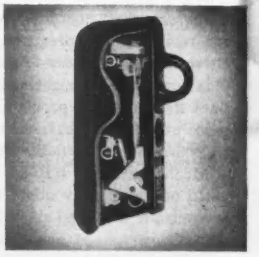
FLEXIBLE DISCONNECT BLADE CAN'T GET LOST! It's fastened to the door—can't be misplaced. This disconnect blade doubles the continuous current rating of the cutout. When the blade is disconnected and the door closed, the flexible cable extends downward to indicate that the circuit is open.

Only G.E. offers you this flexibility of cutout applications. For complete information contact your G-E sales representative, or write for Bulletin GEA-3448. *General Electric Co., Schenectady 5, New York.*

Indicating


Drop-out

Reclosing


Disconnect

GENERAL ELECTRIC

406-39

A Method For Overcurrent Relaying Of Delta-Wye Transformer Banks

Scheme is suitable for distribution systems with transformation of 11-69 kv delta to 4.16/2.4 kv grounded neutral wye

HENRY EVANS, Senior Engineer
Delaware Power & Light Co, Wilmington, Delaware

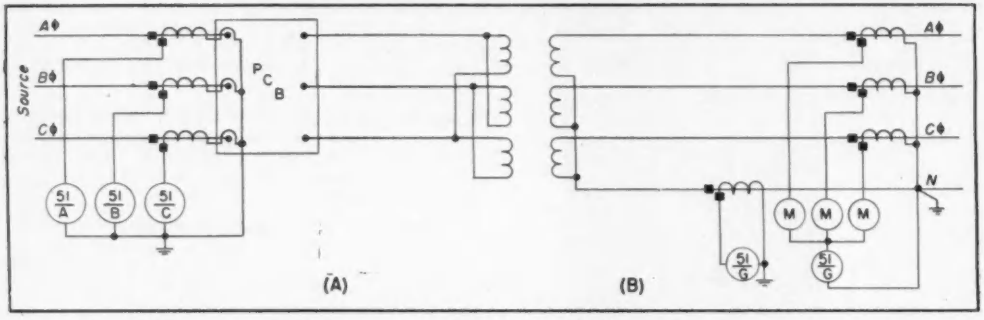


FIG 1—Scheme (A) for overcurrent relaying on primary (12 kv) side and (B) for relaying 4.16 kv phase-to-ground faults (51/G shown at alternate locations)

Conditions—Primary considered as 12 kv and switchgear in 14.4 kv class. Secondary (4.16 kv) voltages lag primary (12 kv) voltages by 30 deg.

For relaying on 12-kv side refer to Fig 1. Overcurrent relays 51/A, 51/B, and 51/C should have a "pick-up" or starting current of 200% of rated transformer capacity and must coodinate with the largest sectionalizing or branch fuse on 4.16-kv systems.

Time-current coordination curves are shown in Fig 2. These curves assume that the largest 4.16-kv fuse with which relays on 12-kv side must coordinate will be 100 N. Most critical condition for relay-fuse coordination exists for phase-to-phase faults hence curve B is set in order to provide ample margin. Note that curve C is farthest to the right and has the least reach. On short 4.16-kv lines this poses no problem, but if distance to first sectionalizing point exceeds a critical value the 12-kv relays will fail to respond to phase-to-ground faults beyond this point.

Means to relay 4.16-kv phase-to-ground faults must be provided on the 4.16-kv side. Where a neutral of a transformer bank is available, a ground relay (51/G) can be installed in conjunction with a low-voltage class current transformer in the neutral lead (see Fig 1). However if three current transformers are installed for metering purposes, the ground relay may be placed in the residual, or return, lead.

To illustrate the advantage gained by addition of this ground relay, refer to Fig 2. Here curve D represents relay 51/G. This relay must coordinate with the largest fuse (100N) and in most cases this limits the sensitivity of the setting rather than allowances for unbalanced load.

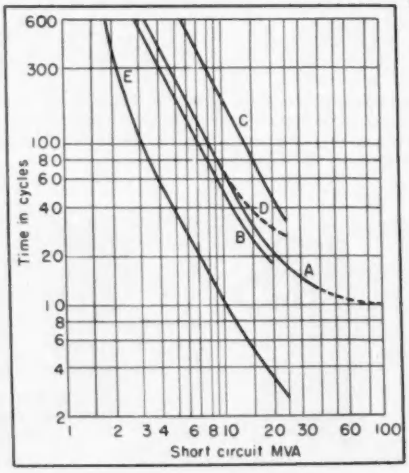


FIG 2—Time-current coordination curves: (A) for all 12-kv faults and 4.16-kv 3-phase faults, (B) for 4.16-kv phase-to-phase faults, (C) for 4.16-kv phase-to-ground faults, (D) for 4.16-kv ground relay, and (E) for 100N fuse

Adapted from a paper "Overcurrent Relaying of Delta-Wye Transformer Banks" presented by the author before the Relay Committee of the Pennsylvania Electric Association at Scranton, Pa.

Perhaps we can give YOU a HELPING HAND

● Under present conditions we cannot always give you all the materials you require. But we can give you plenty of help through Revere's Technical Advisory Service. And, our colleagues in American business tell us it's a worthwhile aid, too. We have been rendering this service for many years, and it is backed by a wealth of knowledge accumulated over a century and a half of working with metals.

So, with your problems on the increase, as whose aren't these days, why not check us on what's bothering you and see if we can't help. We are already helping others regarding the usage, to their best advantage, of the products they *can* get.

Since two or more heads can produce more right answers than one, let's get together. You can get in touch with the Revere Technical Advisory Service through the Revere office nearest you.

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SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Dollies Ease Transfer of Poles and Transformers

A. LOCKARD
Senior Equipment Inspector
Detroit Edison Co

HEAVY DUTY DOLLY rides on three sections of track formed from channels welded to steel plate. Track permits dolly to traverse fairly rough terrain

Three dollies have been developed by overhead lines employees of Detroit Edison Co to transport heavy materials such as poles and transformers to easements and other points inaccessible to trucks.

A pole dolly is narrow enough to pass through ordinary sized fence gates. It rides on pneumatic tires so as to cause little or no damage to lawns. Wheels are equipped with roller bearings for 1¼ in. shaft and are spaced on 18 in. centers. Overall height of wheels is 16 in. A cradle-shaped frame, 24 in. wide by 40 in. long, is built up on and rides directly on the axle.

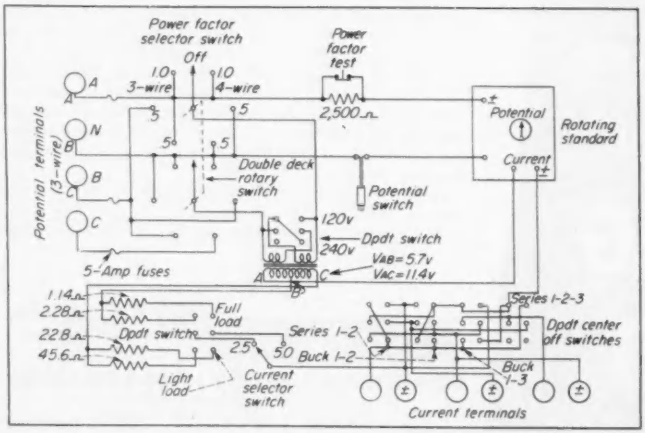
A combination pole and transformer dolly has a frame to carry a pole. A wide platform is provided for a transformer. Adjustable handles allow men to steady and steer the dolly.

For heavy duty, a platform dolly has been built. It has 6-in. heavy-duty industrial casters, two stationary and two swivel. This dolly has a handle with which to pull and guide the load. Three lengths of interlocking track are included with this heavy duty dolly.

These consisted of two channels welded on steel plates. A slightly heavier plain steel plate is used for making turns. By having the crew move sections of track from behind the dolly to in front of it, a heavy transformer can be moved quickly and easily, even over terrain which is fairly rough.

Field Test Polyphase Meters With One Setup

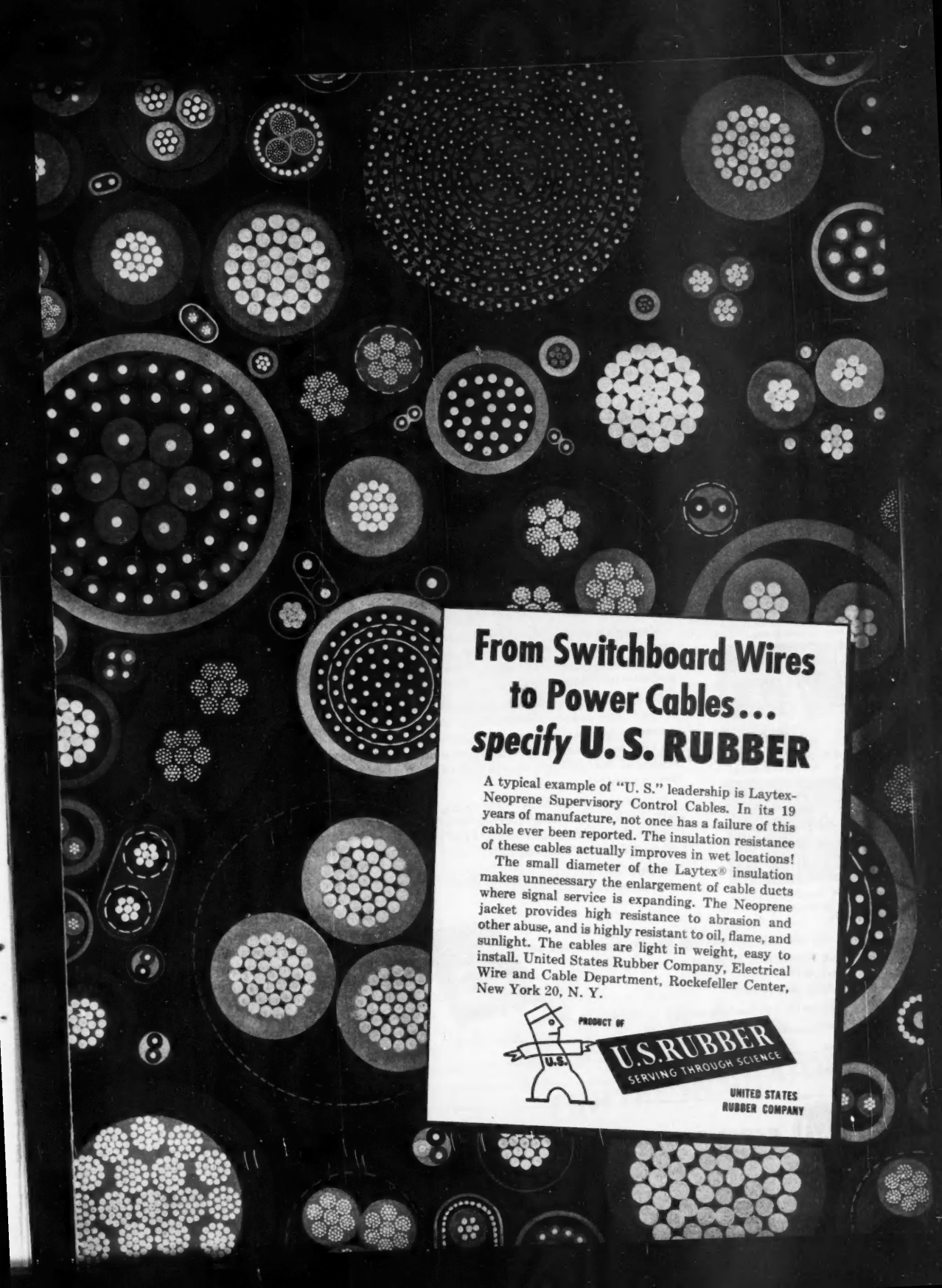
BURKE BREEDLOVE
Electric Meter Division
San Diego Gas & Electric Co



INTERNAL CONNECTIONS of toggle switches and rotating selector switch permit testing of three-wire or four-wire watthour meters without need for external connection changes. Meter test set was designed by San Diego Gas & Electric Co

Accurate field testing of three-wire and four-wire watthour meters takes only half as long with a single complete meter tester designed and built by San Diego Gas & Electric Co. Outstanding advantage of the portable unit is a simple hookup arrangement which requires no changes during testing.

The test set, which uses one rotating standard, is energized by the three-phase meter potentials. Except for a definite terminal connection for the neutral of a three-phase, four-wire metering installation, there is no need to determine phase sequence at the meter. A toggle switch for 120/240-v operation and a rotating selector power factor switch for phase selec-


From Switchboard Wires to Power Cables... specify U. S. RUBBER
A typical example of "U. S." leadership is Laytex-Neoprene Supervisory Control Cables. In its 19 years of manufacture, not once has a failure of this cable ever been reported. The insulation resistance of these cables actually improves in wet locations!
The small diameter of the Laytex® insulation makes unnecessary the enlargement of cable ducts where signal service is expanding. The Neoprene jacket provides high resistance to abrasion and other abuse, and is highly resistant to oil, flame, and sunlight. The cables are light in weight, easy to install. United States Rubber Company, Electrical Wire and Cable Department, Rockefeller Center, New York 20, N. Y.
PRODUCT OF
U.S.RUBBER
SERVING THROUGH SCIENCE
UNITED STATES RUBBER COMPANY

8:30 A.M. Inspector spots trouble and radios for repair crew—right from car.

Track down trouble...faster! with RCA 2-WAY RADIO

8:31 A.M. Dispatcher orders nearest crew to trouble-spot.

8:32 A.M. Truck gets rolling. No lost time. No lost mileage.

8:35 A.M. Repairs start immediately. Service is restored . . . FASTER!

SERVICE TRUCKS can be re-routed immediately to cover emergencies. Aimless driving is eliminated—large reserve fleets are not needed.

Messages can be exchanged between dispatcher and service crews whenever required. Installation . . . and maintenance . . . are accomplished with fewer return trips.

Cable-pulling, wire-laying, pipe-laying can be done faster and co-ordinated easier—through instantaneous communication. Load dispatchers can keep in constant touch with supply sources. Guesswork is eliminated! Outage time reduced! Service speeded!

For the facts about RCA 2-way radio, write Dept. 45X, RCA Engineering Products, Camden, N. J. *(In Canada, write: RCA Victor Company Limited, Montreal.)*

Just Out—*new brochure tells how RCA 2-way radio systems can speed operations.*

RCA ENGINEERING PRODUCTS
Dept. 45X
Camden, New Jersey

Send me the new brochure on RCA 2-way Radio for Industry.

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RCA RADIO CORPORATION of AMERICA

tion energize the phantom load transformer with the proper voltage for unity or 0.5 power factor current.

Unity power-factor current is obtained by energizing the phantom load with the same phase potential as is applied to the potential coils of the rotating standard and meter under test. A toggle switch to determine full or light load is used with a current selector switch to apply the desired current to the standard and meter current coils for either 2.5 or 5-amp ranges. Four double-pole, double-throw, center-off toggle switches switch the current to test the elements individually, in series, or in buck. With these switches in the off position, only

PORTABLE TEST SET includes single rotating standard and phantom load for polyphase meter testing

potential is applied to the elements to test for disk creep.

Two determined positions of the rotating selector power factor switch shift the potential applied to the phantom load transformer for 0.5 power factor test. One position shifts the potential causing current to lead; the second position causes current to lag. Because the proper phase when applied shifts the current by 60 deg lag, a power factor test switch determines which is the proper position of the selector switch for this condition.

Depressing the power factor test switch puts a resistor in series with the potential coil of the rotating standard. This shifts the potential flux toward alignment with the voltage applied to the standard potential coil and with the current flux. Change of relationship of the potential flux

WHY VICTOR PINTYPES KEEP DISTRIBUTION COSTS DOWN

V RUGGED, THICK CROSS SECTION gives maximum strength and resistance to impact.

V LARGE RADIUS TOP AND SIDE WIRE GROOVES make hot-tieing easy and quick.

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V MAXIMUM LEAKAGE DISTANCE conserves current, helps maintain rated voltage, and minimizes outages.

V EACH VICTOR LOW-VOLTAGE PINTYPE is individually inspected at every point of manufacture.

VICTOR NO. 5 LOW-VOLTAGE PINTYPE. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

V HIGHEST QUALITY WET PROCESS PORCELAIN provides highest dielectric and physical strength.

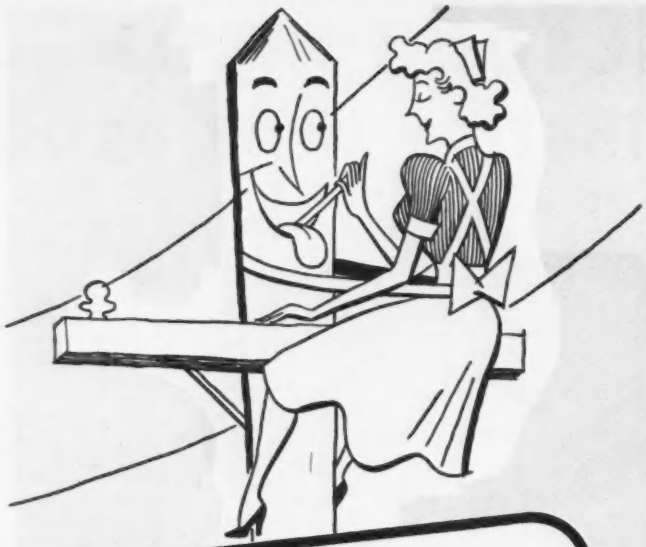
These are only a few of the reasons why VICTOR Low Voltage Pintype Insulators are famous for performance *and* economy. They last longer—give *extra* years of service—cut line maintenance costs to a minimum. Power men everywhere prefer VICTOR Pintypes!

Do You Know that...

The first wet process porcelain insulators were produced at Victor in 1893. In fact, many of our skilled craftsmen have been making high quality porcelain insulators at Victor for over 40 years.

Specify **VICTOR PINTYPE INSULATORS**

VICTOR INSULATORS, INC. VICTOR, N. Y.



Clean Penta protection keeps poles healthy!

Penta is certain . . . always the same!
You can absolutely depend on Chapman Penta for clean, certain protection from ground line decay, shell rot, top rot and insect damage. This modern wood preservative contains Pentachlorophenol, famous for its effectiveness, stability and uniformity. Penetrates deeply into the wood and will not leach out or evaporate. Doesn't affect conductivity or cause corrosion . . . creates no special problems. It's cleanliness makes it the favorite with men who climb the poles.

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CHAPMAN™

Penta Preservative

It's Clean! It's Certain!

Conforming to A.W.P.A. Specifications P8-49 and P9-49.

and current flux causes a change of the resultant torque on the disk of the rotating standard. When lagging current is present, torque will decrease or reverse; when leading current is present torque will increase. Proper selector switch position for 0.5 lag current is thus easily determined.

Because present day practice is to install test switches or test blocks with polyphase meters used with instrument transformers, identified potential and current leads are used between test set and meter under test. These leads are clipped to the test block terminals. Element selector switches eliminate any additional wiring changes throughout the test. Set-up errors and time required to start testing are reduced to a minimum. The meter tester is free to conduct his test without making any wiring changes.

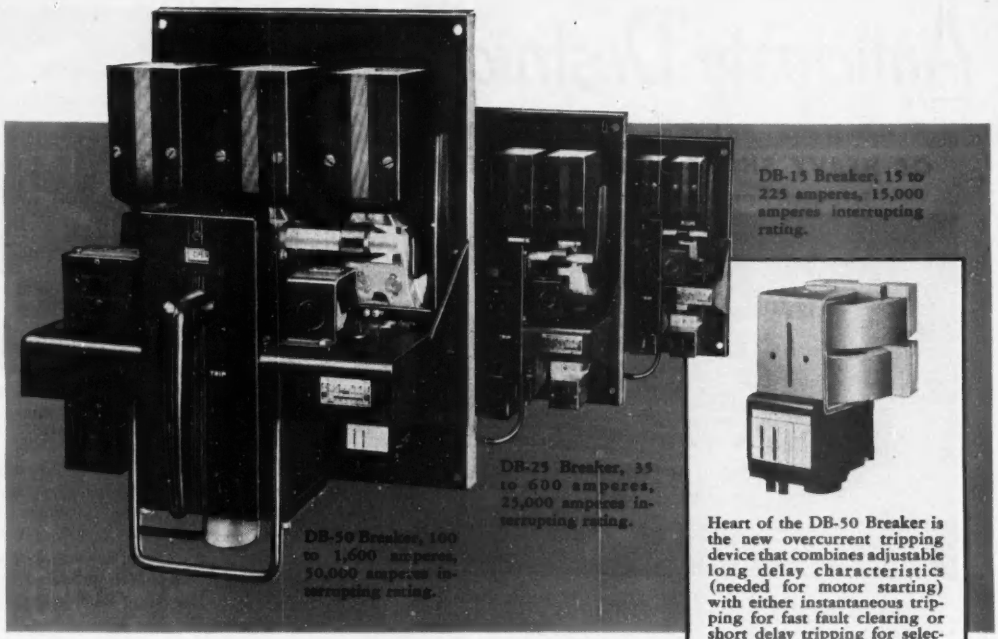
Using a single rotating standard and phantom load for a polyphase meter field test, the test set was built into a single, compact unit measuring 18 x 9 x 9 in. Weight of the unit, which could be reduced further by using a lighter loading transformer and a two range standard, is approximately 25 lb. The test set has been equipped with a strap carrying handle.

Dynamometer Reduces Meter Motor Failures

ULRICH S. FISHER
General Technician
Meter Department
Western Massachusetts Electric Co
Springfield, Mass.

Demand-register motor failures have been practically eliminated among small synchronous motors and cost of testing has been reduced through use of an "Inch-Ounce" dynamometer in the meter department of Western Massachusetts Electric Co. The testing device was originally developed by the company to check type B-7 Telechron rotors used on General Electric Co types M-20 and M-30 demand registers. In a little over two years, over 1,200 motors have been tested and reconditioned at an estimated cost of 35 cents per motor. Use of this testing device has meant a substantial saving to the company, as the motor manufacturer charges $1.70 plus postage per motor for testing and reconditioning in lots of 50.

The dynamometer provides a torque test through a full cycle of the gear train. It will determine the stalling,


DB-15 Breaker, 15 to 225 amperes, 15,000 amperes interrupting rating.
DB-25 Breaker, 35 to 600 amperes, 25,000 amperes interrupting rating.
DB-50 Breaker, 100 to 1,600 amperes, 50,000 amperes interrupting rating.

Heart of the DB-50 Breaker is the new overcurrent tripping device that combines adjustable long delay characteristics (needed for motor starting) with either instantaneous tripping for fast fault clearing or short delay tripping for selective tripping applications.

Now...15,000, 25,000, 50,000 amp.* Breakers *in a UNIFORM DESIGN!*

The new DB-50—most recent addition to the DB line of low-voltage breakers—extends the range of interrupting ratings to 50,000 amperes, continuous current ratings to 1,600 amperes. The co-ordinated design provides uniformity in construction features and operating characteristics, plus a completely flexible overcurrent tripping device.

The ability to close and latch on fault current is the latest and most severe requirement of a modern breaker. This requirement results from delayed tripping schemes designed to provide selective operation. Closely allied is the additional requirement of ability to carry, for periods up to 30 cycles, fault currents equal to the interrupting rating. Contacts, latching mechanism, and closing means of the uniformly-designed Westinghouse DB line of low-voltage air circuit breakers meet these rigid requirements.

The DB-50 has the same desirable unit construction as its smaller counterparts. It is this feature that allows you to add or remove any component as an assembled unit in the field.

Booklets B-4067 on the DB-15 and DB-25, and B-4740 on the DB-50 contain complete information. For copies, call your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

See "Electrical Proving Ground" . . . the dramatic story of the Westinghouse High Power Laboratory in sound and color motion picture. For details, see your Westinghouse representative or write Westinghouse Film Division, Box 868, Pittsburgh 30, Pennsylvania. J-60748

*Interrupting Rating

DESIGN TESTED AND VERIFIED IN THE Westinghouse HIGH-POWER LABORATORY

YOU CAN BE SURE... IF IT'S Westinghouse

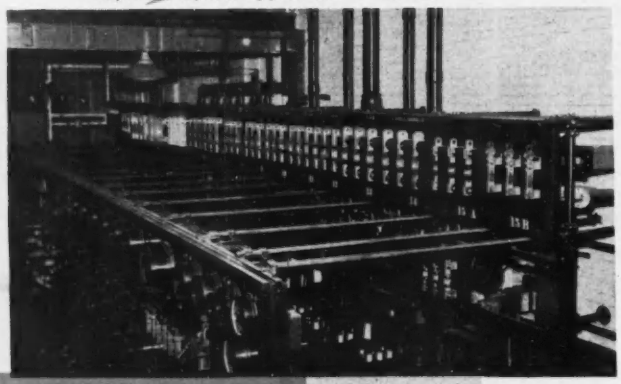
WESTINGHOUSE

"DE-ION" CIRCUIT BREAKERS TYPE DB

Anticipate* Destruction

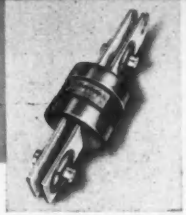
Amp-trap PREVENTS DEVELOPMENT OF HEAVY SHORT CIRCUIT CURRENTS

* To preclude or prevent by prior action — Webster



SHAWMUT Amp-trap*

"T. M. REG. U. S. PAT. OFFICE"



Amp-trap installation at Bird & Son, E. Walpole, Mass., raised the interrupting capacity of the system from 20,000 amperes to 100,000 amperes R.M.S. at 600 Volts, 60 Cycles.

NEW, LOW-COST SHORT CIRCUIT PROTECTION

Amp-trap, with its 100,000 RMS Interrupting Capacity, opens the circuit so fast that it *precludes* the development of the peak available short circuit current. Consequently, it *prevents* both magnetic and thermal destruction. Even phase-to-ground faults are cleared so quickly that multi-conductor faults are usually avoided.

CERTIFIED AND APPROVED

Amp-trap is listed by Underwriters Laboratories. Interrupting tests up to 202,000 amps at 500v 60 cycles have been witnessed and certified by Electrical Testing Laboratories, Inc. Amp-trap is favored by many insurance companies.

FOR SYSTEMS OLD OR NEW

Amp-trap is supplied in all standard ratings up to 4000 amperes for application on any circuit up to 600 volts AC or DC. It can be used on either old or new switchgear with a minimum of structural rearrangement. "Outage" time for installation is negligible. There is no better way to insure your investment in switchgear, bus-ducts, motor starters, circuit breakers and current transformers. Every service entrance on a network system needs Amp-trap protection. The list of Amp-trap users reads like the Blue Book of American industry. Investigate now.

"You Can Get Amp-traps"

WRITE FOR FREE AMP-TRAP BULLETIN TODAY.

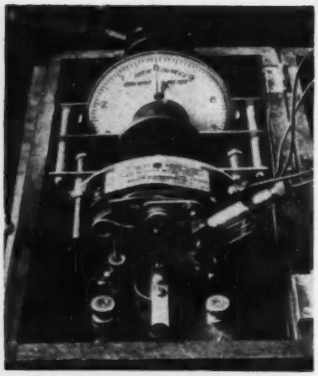
REGISTERED UNITED STATES PATENT OFFICE Est. 1892

AMP-TRAPS — Awake At The Switch

THE CHASE-SHAWMUT CO.

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Amp-trap Trico C-Q-T Trimet ONE O-T TYPE FUSE WIRE



TESTING DEVICE developed for small synchronous motors permits saving of over $1.35 for each motor tested

starting, and running torque of any 1-rpm Telechron motor whose normal field strength is about 2 w. Potential limits are 120-240 v; operating frequency is 60 cycles. Loading torque of the dynamometer is produced by a spiral torsion spring which will give a torque of 10-in.-oz from zero to 360 deg of revolution. Collet end of the spring is staked to the output shaft of a 4-w Telechron motor making 1 rpm. This shaft carries a calibrating scale which is divided into tenths of an inch-ounce with a maximum scale of 10 in.-oz per revolution.

Stud end of the torsion spring is coupled to the loading shaft, which carries the required indicating needle, calibrating disc for 1 in.-oz scale, and engaging gear for the motor to be tested. The instrument may be tested for accuracy by suspending 1-oz weights from the periphery of the calibrating disc, which has a radius of 1 in. One ounce should show a deflection of the indicating needle of 1 in.-oz. Weights may be added until a full-scale reading is obtained. Engaging gear on the loading shaft forms a 1 to 1 ratio with the shaft gear of the motor to be tested. Quick-mounting mechanism insures fast attachment of any motor to be tested. A reactor employed in series with the master motor field is shunted out when the motor on test is a 120-v unit.

Torque Limits for Demand Register Motors

(Inch—Ounces)

Used Motors	Stall	Start	Run
Maximum	8		
Minimum	4	2	2
New Motors			
	Stall	Start	Run
Maximum	10		
Minimum	6	4	4

HI-TENSION NEWS *Junior*

● Shown here are a few of more than 2,000 O-B switch insulators going into a single station. It's quite a lot of insulators, to be sure, but the story behind it is typical of a million or more . . . From their own internal records, power companies know when a certain group of insulators were installed and also how well they have performed. These cold facts can't be altered by any amount of claims or promises -- the record stands on the books! And in over 35 years of manufacturing history, the great bulk of O-B switch insulator business has been "repeat orders" . . . That's why this story of 2,000 O-B switch insulators is typical of probably more than a million. These aren't the *first* O-B's to serve this power company, nor are they the last. Engineers have simply learned to DEPEND upon them!

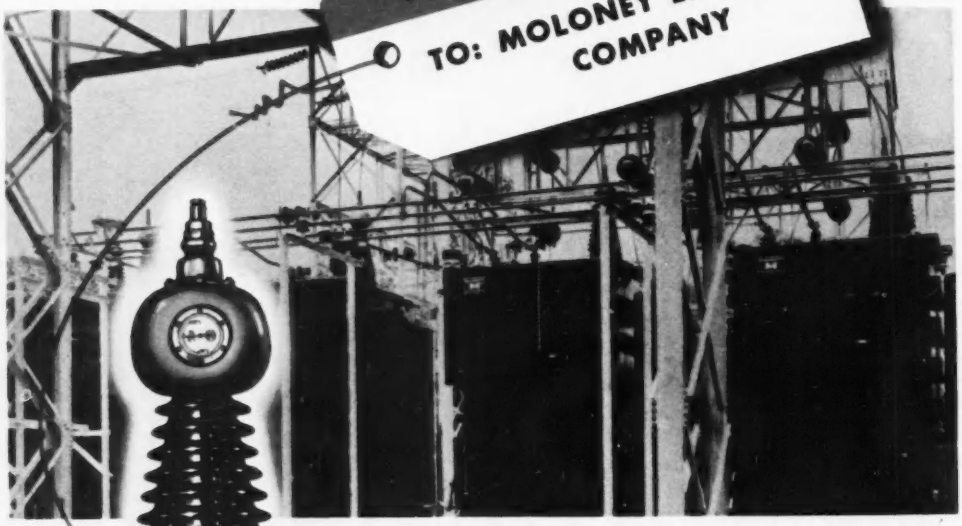
Ohio Brass

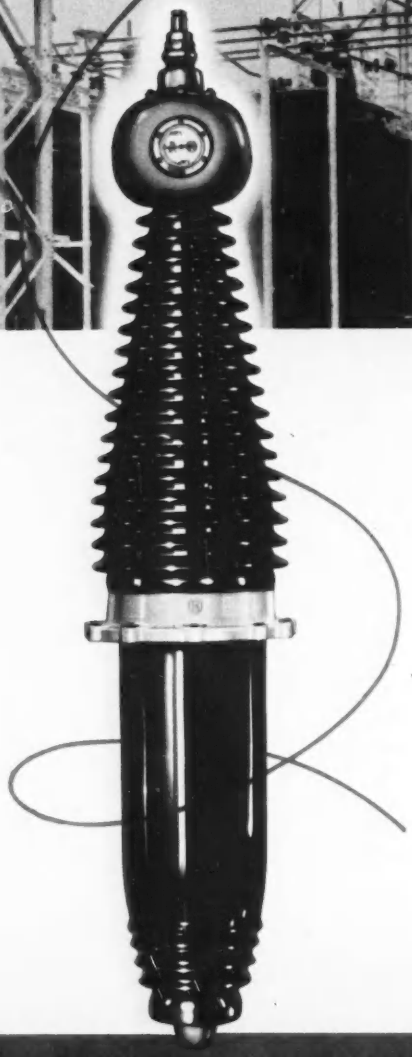
MANSFIELD, OHIO, U.S.A.

HI-TENSION NEWS *Junior*

OHIO BRASS COMPANY
Barberton Division • Barberton, Ohio, U. S. A.

TO: MOLONEY ELECTRIC COMPANY

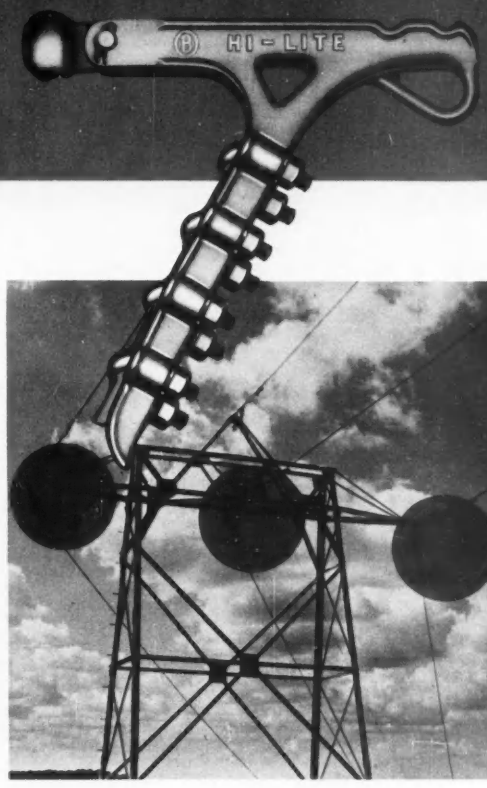




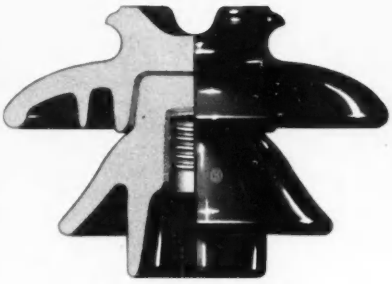
This bank of 110,000-volt Moloney Load Ratio Control Auto-transformers, and spare, are serving today on a large southern utility. Some of the features of this installation as stated by Moloney Electric Company are: "7,500 kva self-cooled, or 10,000 kva forced-air-cooled; rated at 110,000 to 69,000 volts Y, with a Delta tertiary winding. Automatically controlled voltage regulation of plus and minus 10 per cent at the 69-kv terminals is provided in thirty-two 5/8 per cent steps. In-step control is included for maintaining all units on like tap positions. Automatic and manual controls for operation of the bank from one point are contained in a convenient control box. In addition to these refinements, the transformers are equipped with . . ."

O-B BUSHINGS

ONE OF THE FINEST COMPONENTS OF ANY TRANSFORMER



Tested and Proved Against Lightning



● Perhaps this is news to you. With one of the country's largest steep wave impulse generators, the O-B Laboratory has been able to subject all its pintype insulator designs to voltage rises closely duplicating lightning. Such testing suggested re-design in some cases; after which testing was again performed until it was feasible to label all O-B pintypes "lightning-proof." Service experience has adequately confirmed this, as several years have elapsed since the program was completed. Such testing facilities, as well as such a desire, are far from common in the insulator industry . . . Looking at an insulator can't tell you how well its design has been subjected to modern research, but you can be *sure* of this by specifying O-B pintypes.

You See these Jumpers ...But the *Power* Can't

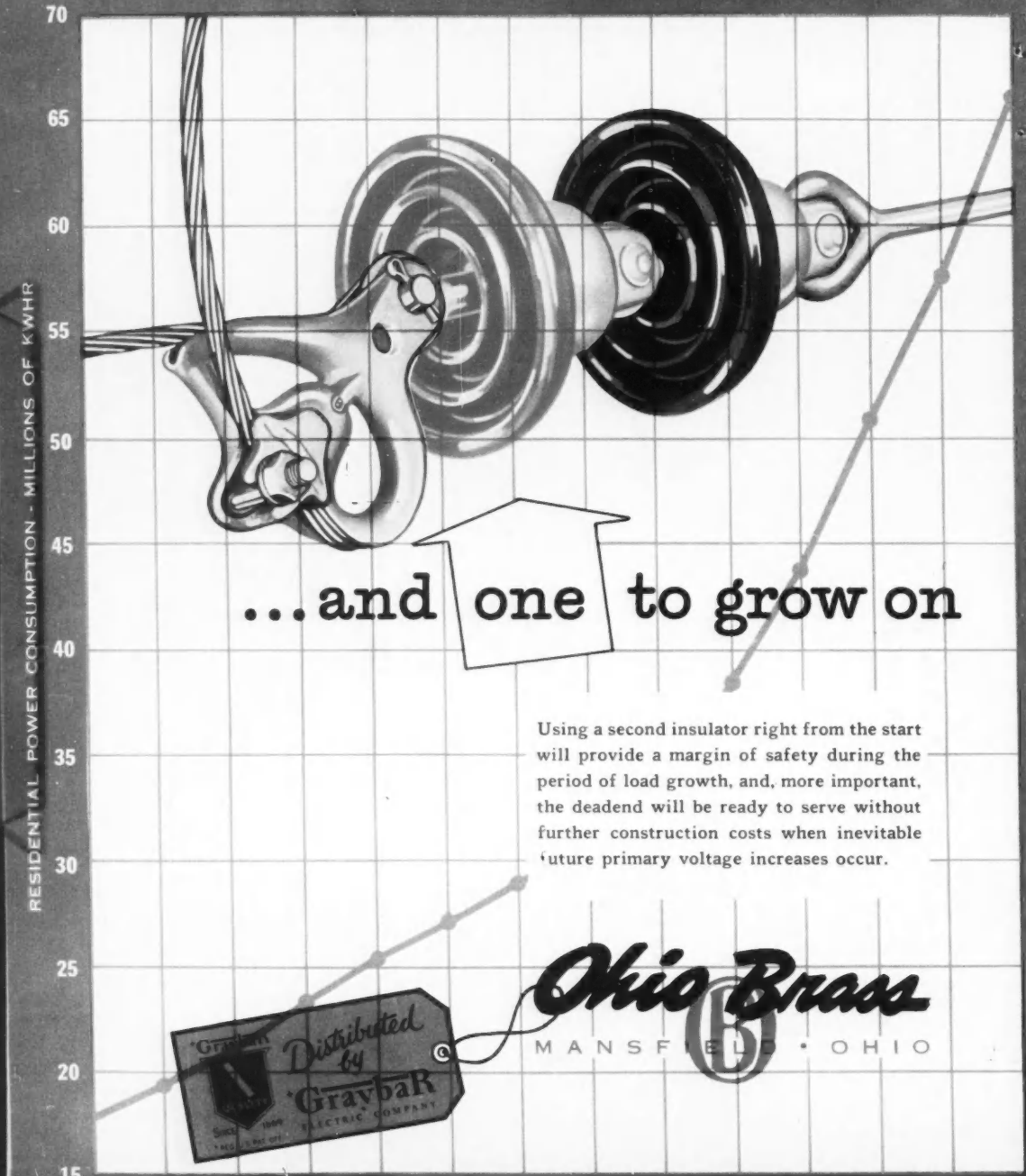
● So far as the power is concerned, these jumpers aren't here. There are no splices to interfere with full conductivity of the continuous cables; no splices to lose efficiency, corrode, and overheat; no splices to make up in the field, sometimes at considerable expense . . . The advantage of unspliced jumper loops is perfectly obvious and, instead of costing what it is really worth, it actually saves considerable money. All it takes is the O-B Hi-Lite strain clamp -- an inherently low cost item of great simplicity and strength, and that attaches to an uncut, endless conductor cable by means of a simple hand wrench . . . Both construction money and operating expense can be saved by building continuous-cable jumpers with O-B Hi-Lite strain clamps. It will be to your advantage to investigate this procedure.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

4146-H

HI-TENSION NEWS *Junior*



...and one to grow on

Using a second insulator right from the start will provide a margin of safety during the period of load growth, and, more important, the deadend will be ready to serve without further construction costs when inevitable future primary voltage increases occur.

Distributed by Graybar Electric Company

Ohio Brass

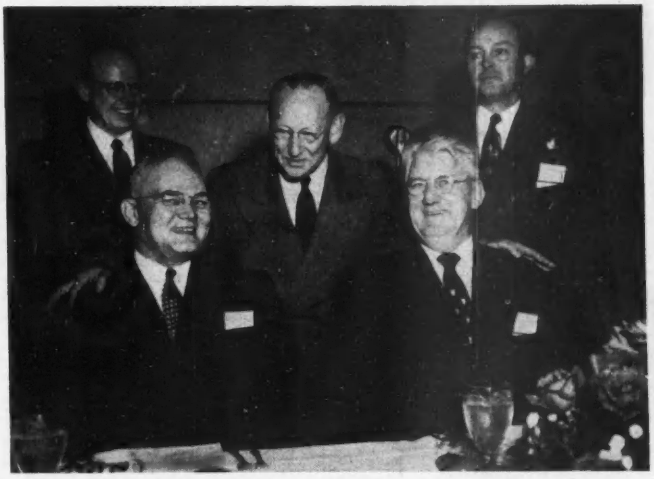
MANSFIELD • OHIO

SALES AND SERVICE

RESIDENTIAL • RURAL
COMMERCIAL

Southeastern Electric Exchange Holds Sales Conference

More than 300 utility sales personnel attending the annual sales conference of the Southeastern Electric Exchange held in New Orleans, October 31 to November 2, were advised and aided by sales experts and executives from the various manufacturers and utility companies themselves. A brief news story covering this conference appeared on page 11 of the November 12, 1951 issue of Electrical World. Here are some abstracts and resumes of some of the other papers presented at this conference.



CONFERENCE SPEAKERS—Standing, J. E. Canfield, president, Public Utilities Advertising Assn and vice president Wisconsin Power & Light Co; Charles A. Collier, vice president, Georgia Power Co; Paul Brooks, Ebasco Services, Inc. Seated, C. B. McManus, president, Southeastern Electric Exchange and president of The Southern Co, Atlanta, Ga.; E. C. Easter, Conference vice chairman and vice president Alabama Power Co, Birmingham, Ala.

Sell Service . . . "Don't sell your customers short just because some idea does not add a kilowatt to your lines," was the advice of C. E. Anderson, Virginia Electric Power Co. He said that you earned your customer's friendship because of your sound selling job. "It appears that our selling job must be centered on service. We must not overlook the little things. These can sow the seeds of good feeling that will not be forgotten later."

In applying electric heat to screens used in sizing operations, excessive screen heating will shorten the life of the screens according to J. B. Whitmore, Appalachian Electric Power Co. Heating input should be limited to a point where the screen will be kept just clear. The proper wire size in the screen cloth must be selected to obtain economical heating and allow maximum production. He said that care should be used in designing and installing bus and leads to be sure that balanced current paths are provided through these leads.

Employee Benefits . . . The utility company employee should not be appealed to directly to do a public relations job for the company's sake alone, said Don McCulloch of Mississippi Power Co. He should be shown what the benefits will be to him. If the employee is public relations conscious, he will help the company tell its story and he will be a greater asset in every way. The first step is to tell your employees about their company—and tell them everything. Give them the information first hand.

Every month electric clothes dryers are using 80,000,000 kwhr and this figure can grow tremendously if utilities get into the dryer business wholeheartedly, in the opinion of Harold P. Bull of Bendix Home Appliances Division of AVCO Mfg. Corp. In pointing to a recent survey of 1,200 dryer owners, he said that 37% liked their dryer because of the work it saved; 31% liked it because it gave them fluffier clothes; 18% because it saved time, and only 14% because it avoided bad drying weather. He said another survey made by Bendix showed how important it is that dealers have a dryer hooked up on the floor and one in use in their own homes.

Industrial Lighting Important . . . Most utilities place more emphasis on selling the commercial and residential lighting market than they do the industrial lighting market, according to E. C. Huercamp, of Westinghouse. He said that lighting in the modern textile mills accounts for from 15 to 25% of the total consumption and in the automotive industry from 30 to 37%. There is a wide choice of systems and the utility should be in a position with competent personnel trained in engineering to explain the advantages and disadvantages of every system.

Ben Askew of Georgia Power Co described some new power applications and equipment to the group. He said that considerable savings can sometimes be made if a customer would install more than one main line switch, rather than one large switch or circuit breaker for the entire load. This is of particular value where additions are being made which would tax already installed main line switches

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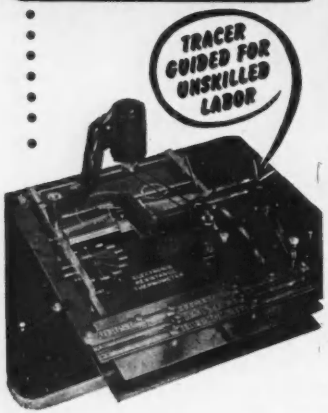
PANELS UP TO 25" WIDE IN YOUR OWN SHOP WITH THE NEW ENGRAVOGRAPH
Portable Model I-S



- The *only* portable machine which reproduces *15* sizes from one master alphabet.
- The *only* one with *adjustable* copy holding slides for multiline engraving in one set-up.
- Self-centering holding vise for nameplates and dials.

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and also would keep part of the plant in operation should trouble develop on a feeder.

Many utility companies do not fully appreciate what a good home service department means to them, in the opinion of Miss Edith Hitchcock, Alabama Power Co. She said that home service speaks the language that women know and understand. They talk about what an appliance will do for the homemaker—not about the size of the motor of an appliance, or the wattage; they talk about the results they get from the range in terms of good food, the beautiful cakes, and the time-releasing oven meals. This is the language homemakers understand and the ability of the home service girl in imparting this knowledge makes her an asset to any utility company.

Heat Pump Desirable Load . . . W. B. Shenk, of Florida Power Corp said that public acceptance of the heat pump in his area exceeds the manufacturer's desire or ability to make and sell it. He presented some tabulations covering 69 installations using 83 heat pump units aggregating a total capacity of 784 tons. Some of these units have been in operation for as long as five years and have been giving complete satisfaction, both to the customer and the power company. Customers with heat pump installations have proven to be the best advertisers for them.

The following relative values of five different methods of cooling or heating, or both, of a typical small store based on an actual installation show that the heat pump represents a most desirable type of business:

1. Straight Ventilation using a 1 hp, 48 in. exhaust fan—annual revenue $66.56 per kw of demand.

2. Electric Resistance Heating using 16 kw—annual revenue $13.60 per kw of demand.

3. Conventional Air Conditioning only, using a 5-ton unit—annual revenue per kw of demand $66.96.

4. Conventional Air Conditioning with built-in electric heaters—using a 5-ton compressor and 16 kw in heating—annual revenue per kw of demand is $40.41.

5. Heat Pump using a 5-ton unit—annual revenue per kw of demand is $79.76.

Over one-third of all heat pumps installed in the United States today are packaged and in sizes between 3 and 10 hp according to H. M. Brundage of the General Electric Co. In the SEE territory over one-half of all units presently operating are between 3 and 5 hp in capacity. About 60% of all the packaged heat pump units used in commercial establishments use air as

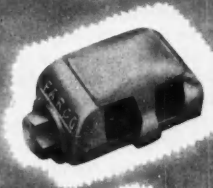
FARGO

"ONE-PIECE VISE-TYPE" CONNECTORS

for { *Aluminum*
Copper
Galvanized Steel
or Any Combination

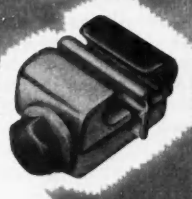
THE "5000 SERIES" FOR ALUMINUM OR COPPER CONNECTIONS

. . . our standard, Everdur, vise-type connector is designed to provide an ideal . . . stay-tight contact—high in conductivity . . . with high compression at low wrench torque. Where a spacer bar is not required, the "5000 Series" is available—plated for use on all-aluminum connections. It is easy and safe to handle . . . requires no attention after installation—and can be used over and over again.



THE "8000 SERIES" FOR ALL-PURPOSE CONNECTIONS

. . . utilizes a spacer bar . . . has all the vise-type advantages—and is available in bronze for copper-to-copper connections. Or in plated bronze for any combination of connections—involving conductors of Aluminum, Copper and Galvanized Steel.



THE "9000 SERIES" FOR ALUMINUM-TO-ALUMINUM OR ALUMINUM-TO-COPPER CONNECTIONS

. . . is available in 3 types: The "9000 Series" for aluminum-to-aluminum connections is made of Tenzaloy—an excellent, high strength, weather-resistant, age-hardening aluminum alloy; the "9000A Series"—also for aluminum-to-aluminum connections—is the same as the "9000 Series," except that a spacer is added; the "9000AC Series" for aluminum-to-copper connections uses Tenzaloy female and Everdur male members, and employs a bi-metal spacer. *All 3 types* have the advantage of like-metal contacts, with desirable *wide jaw design* for aluminum connections.

. . . "built like a vise — grip like a vise."

Ask your Line Material Field Engineer to give you further details.

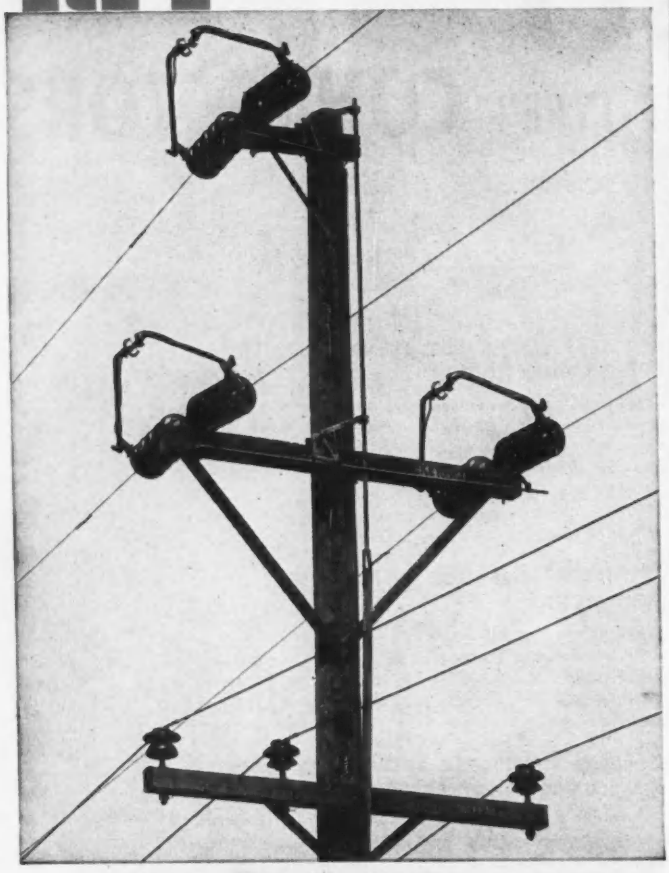
FARGO

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie, N. Y.

Distributed by
LINE MATERIAL COMPANY
A Subsidiary of McGraw Electric Company
Milwaukee, Wisconsin

LM

KPF POLE TOP SWITCHES



Simple design means economical installation

Bore two holes in a single crossarm, tighten two bolts, attach the conductors, and the switch is installed! No separate dead-ends, no "extra" insulators required. Saves man hours, saves installation costs.

Simple design also means lower first cost, less maintenance. Insulator stacks are readily adjustable for line sag. Free-floating, self-aligning, silver-surfaced blades and jaws maintain proper contact under all conditions of sag adjustment. Switches can be used in vertical, horizontal or triangular mountings. The low-cost, trouble-free service rendered by KPF switches is attested by the many thousands in use throughout the world.

KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton, Calif.

the sole source of heat and cooling. With an air source packaged heat pump, the savings in cost of water currently used for dissipating heat from the cooling system in summer alone will substantially assist in paying the cost of heating the premises in the winter. Brundage said that the retail store is second only to the residential market in load building opportunities for heat pump installations.

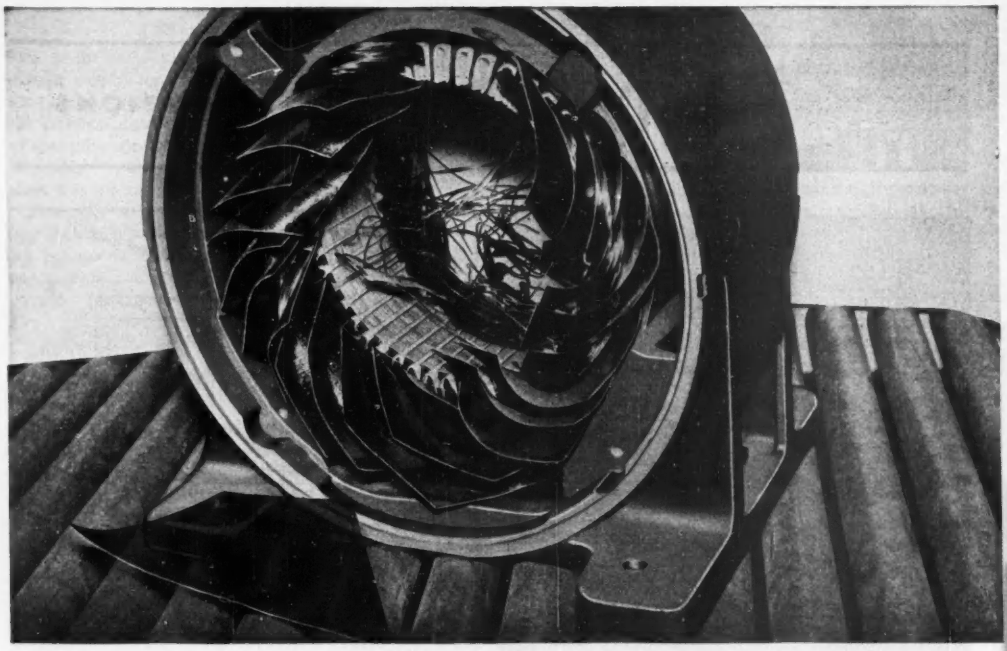
Residence Lighting Profitable . . . Even though there may be a fair supply of major appliances this coming year, greater stress should be placed on developing the home lighting market, in the opinion of J. L. Campbell, New Orleans Public Service, Inc. It is still one of the most profitable loads that we can promote since it is an off peak type load in most areas. The low use customers are a ready market for increased lighting load. Since we get more money per kwhr from the upper brackets of our rate, it is profitable business to sell these customers. With the increase of taxes and higher cost of living, many families will not be able to buy major appliances but can buy lighting equipment without any undue strain on their budgets.

In the year preceding a Planned Lighting Campaign in Indianapolis, the local utility was asked to prepare but 145 lighting layouts, according to S. B. Williams, Sylvania Electric Products, Inc. During the year the campaign was in progress, it was asked to prepare 369 planned lighting layouts and one year after the campaign was ended the number of layouts had increased to 404. Williams said that good lighting can be sold provided the people in contact with the customers know what they are talking about and have something else to sell than price.

Industry Associations . . . John E. Canfield, Wisconsin Power & Light Co and president of the Public Utilities Advertising Association, urged the group to become more active in the industry associations which are doing outstanding work—namely EEI, ECAP, NAEC, and PIP. He said they will give you a lot of ideas on how you can help in your own community to slow up and eventually stop the movement for public power.

Farm wiring has been going forward in the South during the past five years at the average annual rate of

(*Continued on page* 180)



When insulation must stand 500° Heat ...look to IRVINGTON'S Class "H" Line

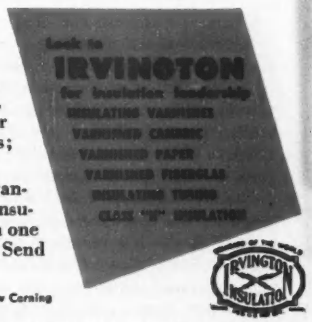
Whether you are winding for service at high ambient temperatures — for increased *continuous* power ratings — for greater *short-time* overload capacity . . .

Or *designing* for space-and-weight savings . . .

You will find the Class "H" insulation you want in the complete Irvington line.

Depending on service requirements, *your* high-temperature insulation job may call for Silicone Varnished Fiberglas*, in yard goods, tape or tubing forms; Silicone Glass Mica; Silicone Saturated or Silicone Coated Asbestos; Silicone Rubber Coated Fiberglas; Silastic** Tape, Teflon Coated Fiberglas.

We make them *all* — we're ready to help you use *each* to best advantage. Write for a free copy of our book — Irvington Class "H" Insulations — it contains samples. Perhaps you'd prefer to talk with one of our engineers. The coupon below is for your convenience. Send it today. No obligation.



*Owens-Corning Fiberglas Corp. **Dow Corning

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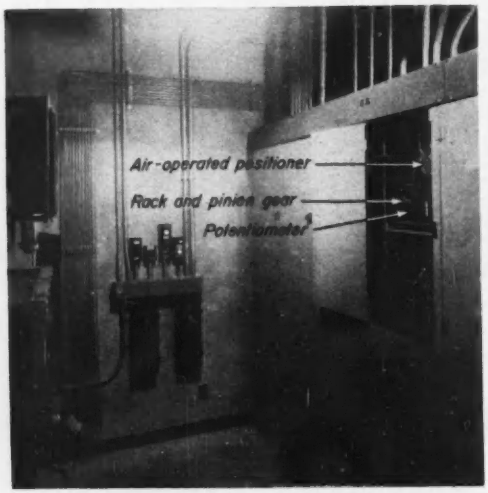
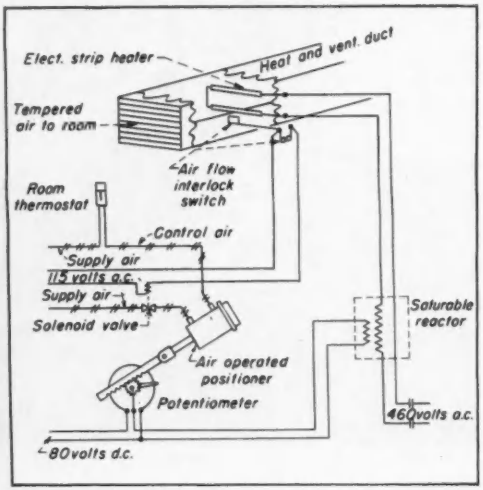


EASY ACCESSIBILITY of control equipment as well as heaters, which are installed immediately within the duct outlets, is a distinct advantage of the pneumatic-electrical system. All moving parts, except for the thermostats, are located in these panels, and no mechanical adjustments are required anywhere else in the system. Total of 20 units have been installed



PNEUMATIC-MECHANICAL-ELECTRICAL linkages provide zone-controlled air-conditioning. Auxiliary electrical heaters at duct outlets bring conditioned air up to temperature desired for that zone, are supplied ac through a saturable reactor. Stepless control is effected by rack-and pinion-operated potentiometer in reactor secondary, pneumatically operated

Outlet Heaters Lick Balance Problem in Air Conditioning

W. H. HAHN,
Chief Project Engineer, Industrial Divn
Bechtel Corp, Los Angeles

Auxiliary electrical heating units installed at each outlet and controlled by a local zone thermostat are an integral part of the single-duct air conditioning system of the new Lever Brothers Company soap and detergent plant in Los Angeles. System permits satisfactory balance of heat distribution to various zones in the plant, since a local change has no effect on the overall system. Control is through a pneumatic-mechanical-electrical linkage, which provides stepless control over the full range of the 2 to 6-kw heaters.

In designing this air conditioning unit, a single-duct system of air distribution was chosen because of space limitations and favorable costs. The conventional single-duct system has the disadvantage, however, of unsatisfactory temperature balance in distributing conditioned air to the various zones of the building. Some adjustment in temperature may be obtained by the use of variable louvres or dampers at the duct outlets. This method is not entirely satisfactory because a change of adjustment at one duct outlet not only alters the volume of air entering that zone, but also affects the amount of air entering the other zones. This frequently results in the destruction of correct adjustment in other zones and leads to a constant effort of balancing and unbalancing.

Departing from the conventional method described above, the Lever Brothers Company conditioning system does not use any adjustable louvres or dampers designed to vary the air flow. Individual electric heaters, each controlled by a saturable reactor which in turn is controlled by a thermostat, are installed just ahead of each duct outlet in the various zones. Air is supplied to the zones under minimum temperature conditions. As it leaves the duct outlet the air is brought up to the desired temperature by the heater according to individual requirement.

Each heater thermostat functions pneumatically by means of the plant air system to vary the setting of an air cylinder, which is in turn linked by a rack and pinion gear to vary the setting of a plate-type rheostat. The rheostat is connected in series with a dc supply to the dc winding of a saturable reactor designed for 1% minimum power. Thus a stepless control furnishes auxiliary heat ranging from 1% to approximately

95% of the heater rating. The direct current supply for the saturable reactor control is obtained from a selenium rectifier. Interlocking is provided so that the entire system is energized only when the air conditioning equipment is in operation.

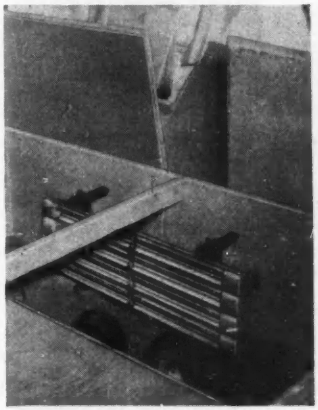
Electricity was used for the auxiliary heaters in preference to steam or gas because of initial cost, minimum expected maintenance, and ease of control. Installation of the heaters in the duct outlets was a simple matter requiring no piping or special venting. Accessibility for maintenance of piping installed in the ceiling would be difficult and expensive. Most important, the electric system offered extreme flexibility of stepless control over a wide range. Also, incremental cost of electric power for auxiliary heating is very low because of the plant's heavy load and high load factor.

Electric Heaters Speed Flood Recovery

In the wake of the recent Midwest flood an instance came to light in which electric heaters proved they could take care of themselves and help get a water-logged plant going again in a hurry. Here's how the job was done when waters receded at Sealright Co, Inc, Kansas City, Kansas.

Four radiant heaters, normally used to dry ink on cardboard, were re-wired in series and allowed to dry themselves at a low heat. They were then installed in a temporary insulated plywood oven. An electric fan was used to circulate air in the oven, making it possible to hold the temperature constant at 200 F.

Operating continuously 24 hr a day, the oven dried 300 motors (75% of the plant's total) and various other equipment in little more than two weeks. After that, heaters were easily and quickly returned to their former occupation.

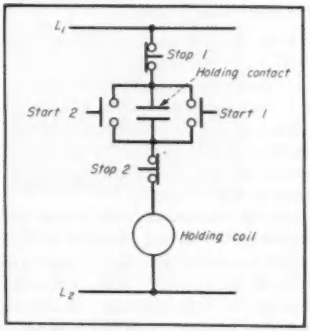


Edwin L. Wiegand Co

RADIANT HEATERS installed in temporary insulated plywood oven dried 300 flood-soaked motors and other equipment in a little over two weeks. Heaters are normally used to dry ink on cardboard

Control Motor from Two Stations

Single motor starter can be controlled by two 3-wire control station stations connected as indicated. Safety lockout is possible at either station. This arrangement saves an additional wire required by customary procedure of using one 3-wire and one 4-wire station. Many standard motor starters have only 3 control terminals. If lockout is desirable at both stations, one 4-wire station is necessary in such cases. Many starters' (particularly the oil-immersed variety) may be readily wired in manner shown. Frank E. Reeves, Electrical Instructions, Baton Rouge, La. (Book publication rights reserved by author).



CONNECTIONS for two 3-wire push button stations for motor starter save a wire

INDUSTRIAL BRIEFS

D-C Power provided by G.E. Ignitron rectifier saves $5,000 a year operating cost compared with previously used steam-driven generators at Milwaukee Lace Paper Co. Station engineers formerly required for d-c power production can now attend to other plant operations. Rectifier operates 24 hr daily, 7 days a week, with minimum attention and provides steadier constant voltage over entire load range and higher short-time overload capacity.

Silk thread drying, after sizing with strip heater, has greatly improved workable condition of thread and improved quality of woven cloth at Corlis Mfg Co, Allentown, Pa. Drying equipment consists of nine curved stainless steel panels 37 in. by 31 in. to the underside of which is attached a 1-kw strip heater. Six threads pass over each panel at 10 yd per min, twice before being wound dry on the bobbin. Total load is 9 kw. P. J. Britt, Industrial Representative, Pennsylvania Power & Light Co, Allentown, Pa.

Assembly of inner combustion chambers for jet engines is now done five times as fast by improved spot welding. Ryan Aeronautical Co, San Diego, Cal., slips a cap, chamber, and exit shell over a post-type mandrel which expands to lock them in precise alignment. Four welding guns fed by two 30-kva transformers make 32 spot welds as work is rotated by an 8-station indexing device. The former method required two men who assembled the work in an unwieldy jig while a conventional floor type machine made individual spot welds and then released the assembly. One man operates the new method. Thomson Electric Welder Co, Lynn, Mass.

Fish Unloading from carrier boats by suction hose at R. J. Peacock Co canning plant in Portland, Me., is six times as fast as by the superseded hand loading and hoisting method. An 8-in. trash pump driven by a 30-hp motor pulls 65 tons of fish out of a cargo boat to storage tanks in about 50 min. Damage to fish during transfer is prevented by "floating" the cargo in water drawn through the hose with the fish.

NEW EQUIPMENT

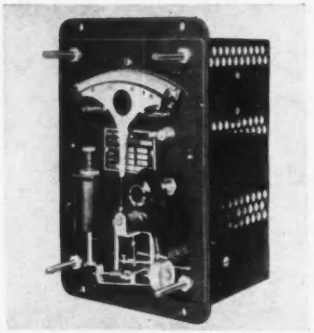
Compact Voltage Regulator

A more compact version of its Rocking Contact voltage regulator for small ac generators has been announced by Allis-Chalmers.

The latest unit is available in two ratings, one with a 34-step commutator (Type V-00) and the other with 50 steps (Type 221). The former has a maximum rating of 157 kva at 3600 rpm and the latter a maximum of 438 kva at 3600 rpm.

The improved regulator has been reduced in overall size.

Rocking contact regulators maintain constant voltage on small generators by automatically changing resistance in the exciter shunt field circuit. Both types have the same outline and mounting dimensions and are designed for use on switch gear, switchboards, or control panels. They



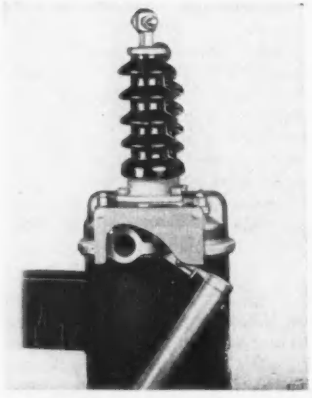
are also well adapted for small portable or stationary power units.

The regulators can also be used for many special applications, such as speed, current, and tension regulation.

Allis Chalmers Manufacturing Co, Milwaukee 1, Wisc.

Recloser Safety Feature

New non-automatic reclosing attachment just announced by Line Material Co, makes it possible to elimi-



nate the reclosing sequence on Kyle reclosers when a lineman is working on the line.

Should a fault occur, the recloser locks out on the first operation, instead of proceeding through the four reclosing sequences.

L-M's non-reclosing attachment is manually controlled by a lever under the sleet hood. This attachment provides greater safety for linemen—permits hot line work with the assurance that if a fault occurs, the line will immediately become dead thereby protecting the lineman.

This non-reclosing device is standard on all L-M type R reclosers, available on all other L-M Kyle reclosers at additional cost.

Line Material Co, Milwaukee, Wisc.

•

Insulation Tester

High Voltage dc test potential is obtained by rectifying output from a high frequency transformer energized by a vacuum tube oscillator.

Current and potential applied to the specimen and measured by means of a vacuum tube bridge circuit feeding a robust milliammeter.

Audible indication of the degree of ionization in the test specimen is obtained by amplifying the ac components of the ionization current passing through the test specimen. A faulty specimen is readily detected by an increase in ionization noise.

Accuracy is reported to be within 10 percent up to 2,500 megohms, 20 percent up to 100,000 megohms.

Herman H. Stecht Co, 27 Park Place, New York 7, N. Y.

•

Industrial TV Camera Tube

Because of its small size, one inch in diameter and six inches long, which is only one-tenth the size of broadcast television camera tubes, it will be possible to position the Vidicon and its associated camera equipment for observation duty in industrial locations that are inaccessible to or hazardous for personnel.

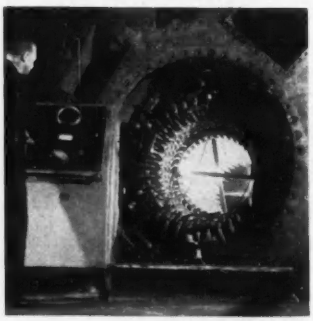
Employing the same photoconductivity principle and basic design as the original Vidicon, revealed 18 months ago, this tube, utilizing a new light sensitive material in conjunction with other technical advances, has a greater life span than the earlier tube and a wider operating range.

Radio Corporation of America, Camden, N. J.

•

Electronic Surge Comparison Tester

This new industrial electronic surge comparison tester may be used to locate insulation faults and winding dissymmetries in motors, ac and dc generators, transformers and coils.



The surge comparison tester reportedly has an adequate surge voltage characteristic for most tests.

The tester simultaneously tests turn-

JOHN LINEMAN SAYS:

For Secondary Service

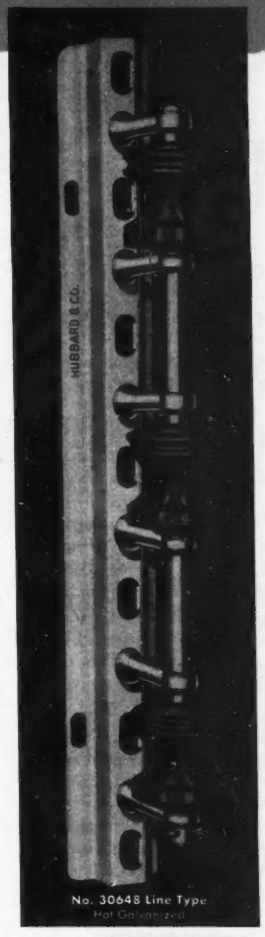
HUB-RAKS COME FIRST

"Gosh, right through the center of every hole."

"I thought I was husky, but I'm not in it with the HUB-RAK."

"For back-to-back mounting, bolts do double duty."

"If there's a place to hang it, there's a hole to match."



HUB-RAKS are furnished for 1 to 4 line wires with conductor spacings from 4 to 12 inches.

"Points strong as an ox . . . smoothly rounded too."

"Highest grade porcelain insulators, smooth surfaces, sure easy on conductors."

"Installation or replacement . . . it's dead easy with the HUB-RAK."

"It sure is the finest rack ever made."

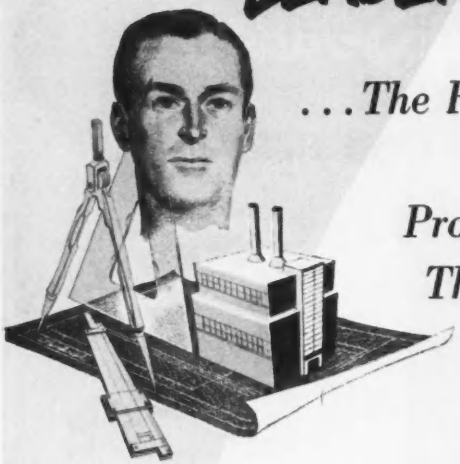
HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

LEADERSHIP



. . . The Result of Progressive Thinking

THE big reason for America's industrial leadership is Management's studied practice of progressive thinking which points the way to orderly advance along sound, constructive lines.

Evidence of this is clearly indicated by the growing tendency of Management to utilize the specialized services of independent consulting engineering organizations which in a single service provide completely coordinated staffs of architectural, civil, chemical, electrical, and mechanical engineers highly skilled and experienced in their respective fields.

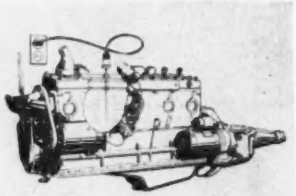
The Peter F. Loftus Corporation is such an organization and has over the years cooperated with the management and engineers of utilities, industrials, institutions, and governmental agencies in such vital matters as modernization programs, new plant designs, expansions and related projects.

Peter F. Loftus Corporation
Established 1923
ENGINEERING CONSULTANTS
First National Bank Building, Pittsburgh 22, Pennsylvania

to-turn, phase-to-phase, and coil-to-coil ground insulation with potentials high enough to simulate power circuit transient stresses. With every test set up, high frequency and high-potential qualitative tests of resistance, impedance, and turn balance are made, and the results are obtained by a single scope observation. High turn-to-turn voltages are applied without excessive winding-to-ground stresses. Non-destructive testing is reportedly assured even on fractional horsepower motors and generators. Destructive fault location is possible in many cases.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

•



Engine Headbolt Heater

A 650 watt immersion-type heating element, wired through the radiator grill, extends down into the water jacket to provide quicker starting, with improved lubrication.

Once installed, they are left in the engine year round.

Five Star Manufacturing Co, East Grand Forks, Minn.

In Saskatoon, Saskatchewan, where winters are really cold, the parking meters have been hooked up to city power lines. When you park your car, plug in extension cord from meter to your heater and stop worrying about freezing weather.

•

Cold Cathode Fluorescent Fixture

Uniform distribution of light throughout the room is reportedly provided by the new Flolite Hairpinline cold cathode fluorescent fixture. Low surface brightness of Flolite lamps (2.5 candles per sq. in.) permits use without louvers to shield glare.

which of these feed-in duct features *rate highest with you?*

architects

rate these SQUARE D features particularly high:

lowest known voltage drop . . . maximum efficiency, minimum power loss

smallest cross-sectional area . . . conserves valuable installation space

contractors

give these features top billing:

reduced installation time . . . simplified components, factory prefabrication

new joint design (*lower right*) . . . all joint ends identical, connection bolts face outward

interchangeable standard fittings . . . permit horizontal or vertical riser applications

users

vote these SQUARE D features tops:

low cost installation and maintenance . . . most accessible connections

totally enclosed . . . permanent safety construction, excludes dust

completely reuseable . . . rearrangement with the same components

EXCLUSIVE JOINT DESIGN

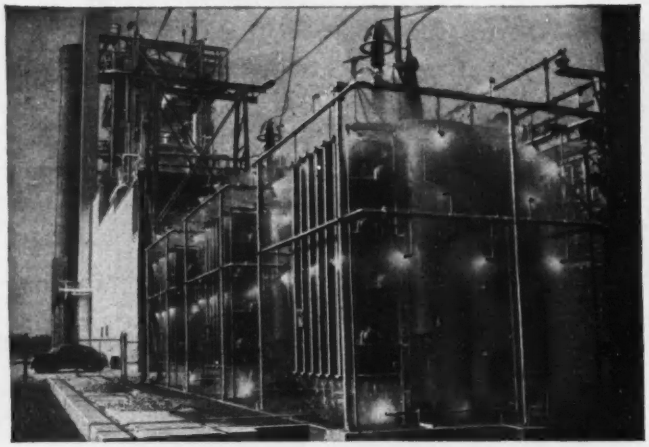
SQUARE D's exclusive joint design saves installation time and reduces maintenance cost. Joint ends are identical—unnecessary to select mating ends before positioning or hanging duct sections. Outward-facing, pre-installed bolts permit rapid assembly and easy maintenance.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.



Protection for both your Equipment and your Customers

Financially, a transformer fire isn't so important, but the resulting black-out of power and light service to homes, hospitals, defense plants and municipal properties may well prove tragic. Protect your customers by protecting your transformers with a

Deluge Systems, Wet Pipe Systems, Dry Pipe Systems, Water Spray and Fog Systems, Rate-of-Rise Sprinkler Systems, and Foam and Carbon Dioxide Extinguisher Systems.

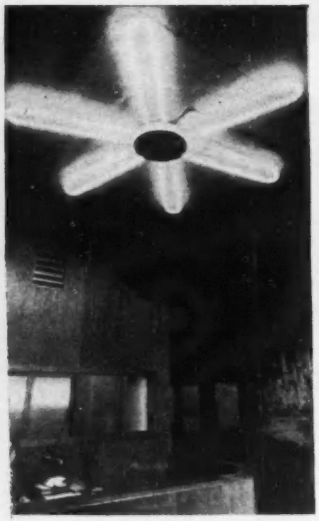
BLAW-KNOX
AUTOMATIC FOG SYSTEM

Through fast-acting rate-of-rise thermostats, any critically hot transformer is instantly blanketed with a heavy, quenching "fog" of water, confining the damage and protecting adjacent areas . . . materially reducing power failures in both frequency and extent. Without obligation Blaw-Knox engineers will survey your fire hazards, make a layout of the most efficient system and estimate costs. Blaw-Knox Fire Protection Systems carry the approval of all underwriters.

Always on the Job!

BLAW-KNOX SPRINKLER DIVISION
OF BLAW-KNOX CONSTRUCTION COMPANY
829 Beaver Ave., N.S., Pittsburgh 33, Pa.
Offices in Principal Cities

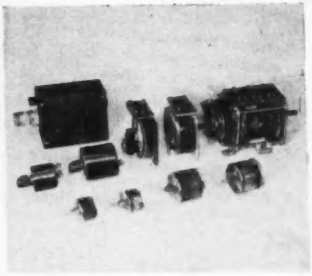
BLAW-KNOX AUTOMATIC FIRE PROTECTION SYSTEMS



Close control of color characteristics is reported possible because of the special combination of gases used in Flolite lamps—a formula of neon, argon and vaporized mercury.

Mobeco Inc, Watertown 72, Mass.

•



High Cycle Variable Transformer

Powerstat variable transformers are now available for 400/800 cycle operation.

Units are available in a multitude of voltage and current ratings in single and polyphase models.

Superior Electric Co, Bristol, Conn.

•

Step Gage

A new instrument for accurately measuring the thickness of thin films by means of color comparisons has been announced by GE's Special Product Division.

Successive layers of barium stearate

(*Continued on page* 158)

A well-rounded analysis

in an easy-to-read capsule form

The INTEGRATED POWER SYSTEM

As the Basic Mechanism for Power Supply

Note what reviewers have said about this book:

"The author, a leader in the power industry, has produced a book unique and dynamic by describing the human, social, and economic objectives as well as the physical and technical means to realize these ends. The book should be read by all executives, engineers, and administrators whose jobs it is to obtain more economic power systems".

—ELECTRIC LIGHT AND POWER

"It is particularly refreshing to see a man like Philip Sporn do a very thorough job of expounding the concepts of modern electric power systems in only 146 pages".

—GENERAL ELECTRIC REVIEW

"Philip Sporn's latest book is of unquestionable value as a source of general information on the organization, development, and operation of an integrated system".

—RURAL ELECTRIFICATION

By PHILIP SPORN

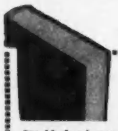
President, American Gas and Electric Company

157 pages, 5½ x 8, 28 illus., $4.00

THIS BOOK presents a compact, easy-to-read survey of the economic, sociological and technical aspects of the integrated power system as a source of the adequate electric power so important in conserving our natural and human resources. It considers the economic advantages of the system, also analyzes the multitude of technical considerations involved, pointing up the coordination necessary to achieve the full results of which the integrated system is capable.

Check this book for information on the integrated system such as:

- its advantages and disadvantages
- its technical bases
- importance of skilled coordinating personnel
- sources of power
- components and tools
- how it develops latent energy
- its social economic position
- and many other questions



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330 W. 42nd St., New York 18

Send me Sporn's THE INTEGRATED POWER SYSTEM for 10 days' examination on approval. In 10 days I will remit $4.00, plus few cents for delivery, or return book postpaid. (We pay for postage if you remit with this coupon; same return privilege.)

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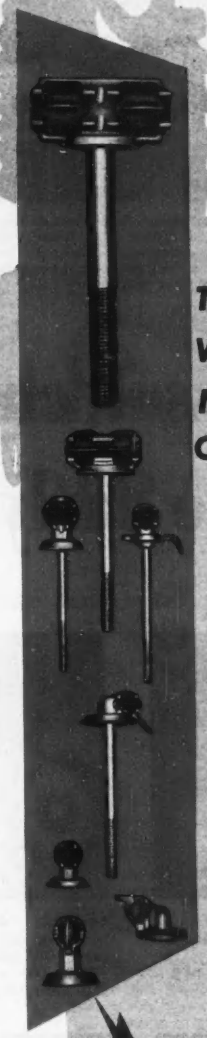
Company .....
Position FW-12-3-51

This offer applies to U. S. only.

TRANSFORMERS and CONNECTORS *Go Together For* YEAR IN YEAR OUT DEPENDABILITY



Specify TRANSFORMERS EQUIPPED WITH ABW MERCUROUS NITRATE RATED CONNECTORS . . .

For your protection against connector seasonal and stress corrosion cracking failures, exacting transformer manufacturers demand ultimate connector performance certified by mercurous nitrate test standards.

Perfection of connector designs has enabled Anderson Brass to surpass this ultimate of engineering requirements and as a result for many years we have furnished the major connector needs of the transformer manufacturers.

Routine mercurous nitrate testing in accord with specification ABW 124-1* is part of our quality control.

Our products are backed by many years of coordinated electrical, mechanical and metallurgical engineering knowledge and manufacturing experience gained in meeting and maintaining the most exacting standards of the electrical industry.

**Write today for mercurous nitrate test specification ABW 124-1*

ABW

Consult one of our nearest 17 representatives or contact our main office

Anderson Brass Works, Inc.

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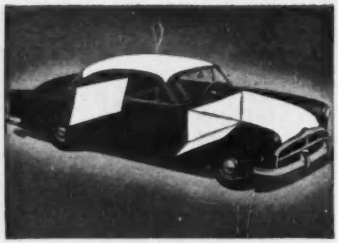
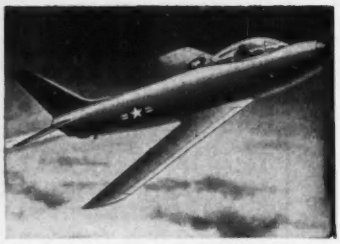
BIRMINGHAM, 1, ALABAMA

• BRONZE AND ALUMINUM POWER CONNECTORS, FITTINGS, AND BUS SUPPORTS
ALUMINUM SUSPENSION AND STRAIN CLAMPS

Automobile tops, insulated with L·O·F Fiber·Glass against heat and cold, increase passenger comfort. Easy installation. Light weight. Won't deteriorate under normal conditions.

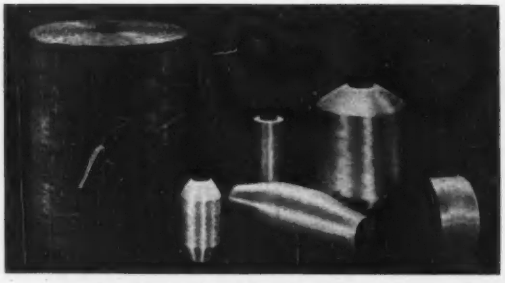


Automobile sound insulation a made-to-order job for L·O·F Fiber·Glass. Easy installation in doors, under the dash, on the fire wall, under the hood. Low moisture absorption, light weight.

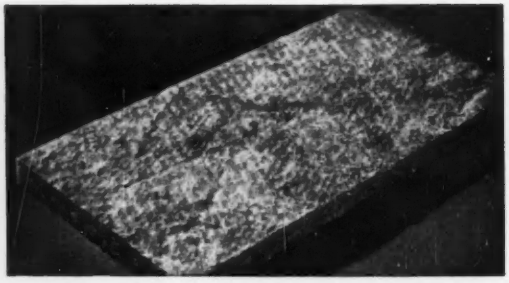


Aircraft sound and thermal insulation. Get these advantages of L·O·F Fiber·Glass. Light weight (as low as .3 lb. per cu. ft.). High fire safety. Low moisture pickup. High sound-insulating efficiency.

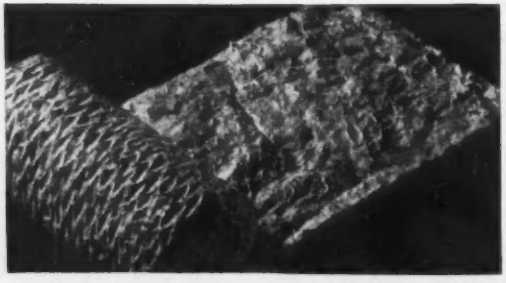
Proven glass technology plus now devoted to early production



Continuous Fiber Textile Yarn—150 series for many uses, such as electrical insulating tape, sleeving, cloth, roving, and paper reinforcement. Glass fibers have enormous tensile strength . . . 250 thousand pounds per square inch. High dielectric strength. Withstands temperatures up to 800°F.

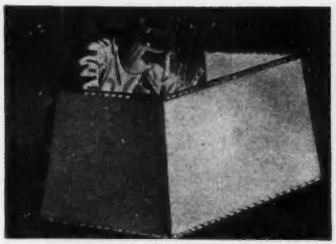


Super-Fine "B" Fiber—Splendid thermal- and sound-insulating qualities. Fiber diameter, .00012". Temperature range –0°F. to plus 450°F. Standard roll widths, 18", 24", 36", 72", in 100' and 200' lengths. Other widths and lengths also available in a range of thicknesses and densities.

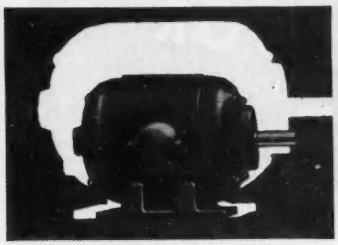


Super-Fine "AA" Fiber—primarily for aircraft insulation. Thickness, .5" with density of .6 lb. per cu. ft. Fibers of incredibly small diameter—.00004". With plastic binder to hold dimensional form. Roll widths, 36", 72", in 50' standard length.

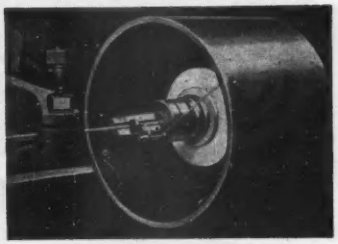
Roving, Chopped Strand and Textile Yarns—for reinforcing of plastics, paper, cloth and paper tape, etc. Enormous tensile strength. Won't shrink or stretch. Won't deteriorate under normal conditions. Versatile in application.



Industrial fabrics woven from Fiber·Glass are fine, safe, strong, rot- and mildew-proof. Ideal applications are tarpaulins, flame shields, airplane cloth, reinforcement for plastics.



Electric motors and generators insulated with L·O·F Fiber·Glass withstand heavy overloads. Appreciable space factor advantages! High dielectric strength.



Wire and cable can be served directly with L·O·F Fiber·Glass textile yarns using standard machines. Yarn also ideal for weaving tape, and braiding on wire and into sleeving.

fine, new facilities of L·O·F FIBER·GLASS!

Aviation, automotive, textile and electrical industries first to benefit from new, high-quality source of supply being readied by Libbey•Owens•Ford

HERE IS headline news of *immediate* interest to key men of business and industry.

The resources and advanced technical glass knowledge of Libbey·Owens·Ford are being focused on a new product—L·O·F Fiber·Glass!

With fine, new facilities at Parkersburg, W. Va., placed to serve you quickly, glass technicians of proven ability and experience are getting set to produce top-quality Fiber·Glass products in volume. (See facing page for basic items to be produced. Note above and right for typical applications.)

Across the country, in 24 major cities, L·O·F offices are busy with preparations to give you help on specific uses.

If your company has already discovered the superior qualities of fibrous glass, investigate L·O·F now as a new volume source, worthy of your complete confidence.

If your company now buys other material for electrical insulation, thermal or acoustical insulation, or reinforcing for plastics or paper, L·O·F Fiber·Glass can offer a combination of advantages unmatched by such other materials. This is a chance to benefit from the glass technology and the high standard of quality which you have come to expect from L·O·F!

For technical data, or engineering consultation on Fiber·Glass uses in your business, call your local L·O·F office—or write, wire or phone Libbey·Owens·Ford, Dept. F·G 114, Nicholas Bldg., Toledo 3, Ohio.

Plastic reinforcing, as in this bread tote tray, presents many possibilities with L·O·F Fiber·Glass. Remarkable strength. Won't dent or lose shape. No discoloration of plastic material. Exceptionally long life.

Paper and paper tape reinforced with L·O·F Fiber·Glass can be raised in tensile strength to equal aluminum or even steel! Either Fiber·Glass textile yarns or scrim mesh are suitable. Investigate!

LIBBEY·OWENS·FORD GLASS COMPANY
FIBER·GLASS DIVISION

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APPROVED FOR R.E.A. USE

No. 1261

SUSPENSION TYPE INSULATORS

Dead End	No. 1261, 6" dia.
Ball and Socket	No. 1253, 10" dia.
Clevis Type	No. 1270, 7½" dia.
	No. 1271, 10" dia.

REINFORCED WIREHOLDER INSULATORS

Reinforced Type	No. 1937 2¼" Screw
Reinforced Type	No. 1937-3 3" Screw

No. 1937

No. 101

SPOOL TYPE INSULATORS

Secondary Rack	No. 101, 1¾" dia. Groove
Secondary Rack	No. 96, 3" dia. Groove
Service Rack	No. 100, 1⅜" dia. Groove

GUY STRAIN INSULATORS

No. 502, No. 534, No. 536, No. 538, No. 540 — Use dependent upon strength and cable requirements

No. 502

No. 175

PIN TYPE INSULATORS

One Piece Pin Type

No. 135 No. 175 No. 253
No. 261 No. 266

Multi-Part Pin Type

No. 2027 No. 2045 No. 2055

No. 261

DEAD END CLAMPS, SUSPENSION CLAMPS AND FITTINGS

Write for Complete Information and Prices

ILLINOIS
ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

are deposited in such a way as to build a series of steps made up of ten layers, each one microinch thicker than the preceding one.

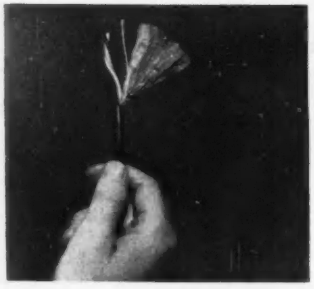
To determine the thickness of an unknown film, it is compared with the colors on the gage to find the step which most nearly matches color of unknown film.

General Electric Co, Schenectady.

•

Electric Cord Filler

This new filler for electric cords, composed of soft kraft paper wrapped about a core of Fiberglas yarn is reportedly less expensive than conventional filler which has been used in the past.



In addition to effecting savings in fabrication Glascor reportedly provides faster stripping and is more uniform in strength and size.

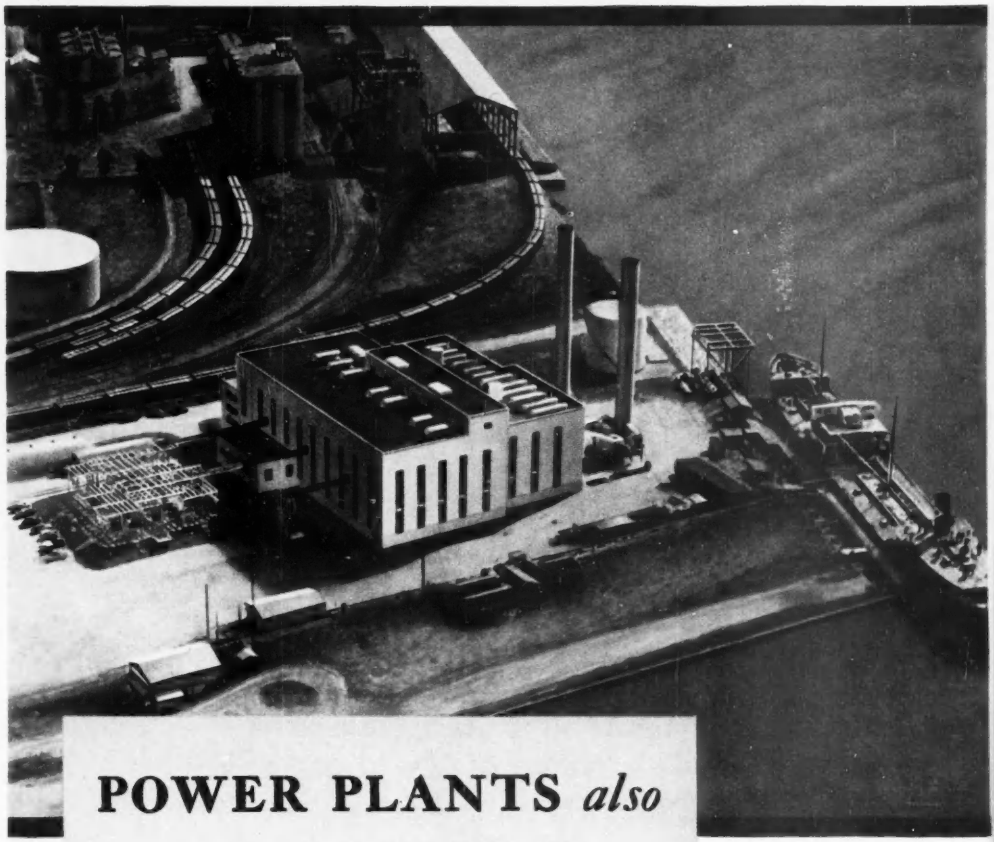
Low cost paper provides filler bulk while Fiberglass yarn provides strength.

E. W. Twitchell Inc, Philadelphia, Pa.

•

Wordwriter

An electric typewriter which automatically writes stock phrases such as "dear sir" and "yours truly" at a single



POWER PLANTS *also grow fast in Florida*

The Hookers Point Station of the Tampa Electric Company, located on the Sparkman Channel, near the southeastern limit of the city. The first 30,000 kw capacity was completed in 1948.

THE 30,000 kw capacity of Tampa Electric Company's Hookers Point Station, designed and constructed by Stone & Webster Engineering Corporation, was tripled in 1950 with the completion of a 60,000 kw extension. A further expansion, now under way, will raise the name-plate capacity of the station to 130,000 kw.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

for Radio Relay Performance

AT ITS BEST—IT'S

PTM MICROWAVE by Federal

"FIRST Commercial Radio Relay System in North America"

PTM GIVES UTILITIES complete, private, low-cost, high-reliability communications—with adequate channel capacity for expansion of centralized operation

Federal PTM Microwave offers the most stable basic channels for telephone, telemetering, supervisory and remote control, mobile radio and all other needs

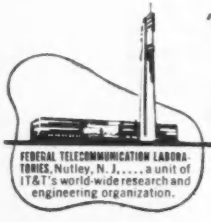
PROVED-IN . . . *by utilities!* That's why utilities can rely on Federal Pulse-Time Modulation Microwave . . . the modern system developed by the world-wide International Telephone and Telegraph Corporation, pioneer in microwave techniques. Tens of thousands of channel-miles of PTM have been installed in 15 countries by IT&T associates.

Federal PTM—*first* system to serve utilities—provides *all* communication facilities *simultaneously* . . . under all weather conditions and over long distances, independent of power lines . . . using equipment of highest RF output and simplest design. For full information on *radio relay performance at its best*, write to Wire and Radio Transmission Systems Division, Dept. D-717.

HIGH POINTS of PTM PERFORMANCE

- Unaffected by fog, rain, snow, ice, static or magnetic storm.
- High signal-to-noise ratio.
- Outstanding for high quality of voice and other transmission.
- No inter-channel crosstalk due to non-linearity of common elements.
- Energy beamed by non-critical, directive parabolic reflectors.
- High power allows large fading margin.
- 99.22% reliability achieved without RF stand-by.

"Federal Microwave—The System Backed by 20 Years of Experience"



FEDERAL TELECOMMUNICATION LABORATORIES, Nutley, N. J., ... a unit of IT&T's world-wide research and engineering organization.

Federal Telephone and Radio Corporation

100 KINGSLAND ROAD CLIFTON, NEW JERSEY

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., N. Y.

FEDERAL TELEPHONE & RADIO FTR — An IT&T Associate

key touch has been developed.

The operator selects and sets up beforehand a maximum of forty-two 18-stroke words or phrases. Each phrase may be used anywhere on the page.

Groups are written at the rate of 150 words per minute.

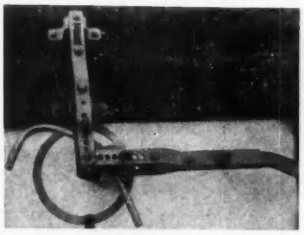
International Business Machine Corp, New York, N. Y.

•

Thin Wall Conduit Bender

A new type of bending die adapts the No. 2 Universal Iron Bender to bending of thin wall electrical metal conduit.

Full 90 deg bends in conduits of



1¼-in. or smaller may be made by direct leverage with one sweep of the hand lever.

Hossfeld Manufacturing Co, Winona, Minn.

•

Down-Coiler Motor

This new heavy-duty, mill-type, flange-mounted down-coiler motor, has been designed to operate under some of the severe conditions found in steel mills.

Motor is equipped with a heavily reinforced flange mounting, double row ball bearings, and cast brass mill-

LET'S nail it down! Too many of the fires that cost industry millions of dollars every year *are* acts of negligence. Of putting off till tomorrow and then ducking the issue of proper fire protection.

The plant you see above *was* a factory, but fire can cause huge damage in utility operations, too. Generators, switching equipment, transformers are all vulnerable. Once destroyed they can be replaced only after long delay. Common prudence says they deserve the best protection available.

It's worth noting that the first "CARDOX Low Pressure Carbon Dioxide System"* ever built was for protection of central station equipment. The utility industry has been a major buyer of CARDOX Systems ever since.

Applying CARDOX CO_2 in tons or pounds by highly specialized and engineered systems, CARDOX protection is today standard with many utility companies. Indoors or out, CARDOX Systems hold fire damage to a minimum and eliminate extinguishment damage entirely.

CARDOX engineers *know* the utility industry and its fire protection needs. For better protection of existing equipment *and whenever you plan an expansion* call in CARDOX. A letter is all it takes!

*Covered by Patents Issued & Pending

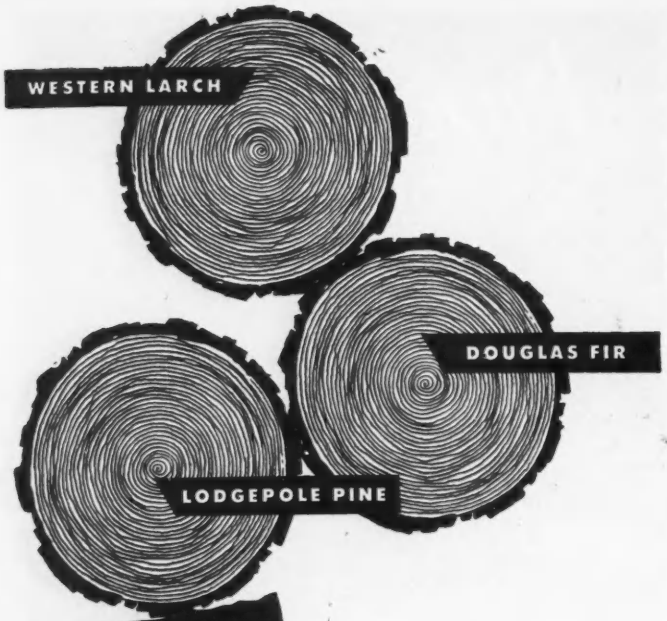
CARDOX

ORIGINATOR OF **Low Pressure CO_2**

FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • BELL BUILDING • CHICAGO 1, ILLINOIS

Offices in Principal Cities



THE Big 3 IN WESTERN POLES

• produced
• treated
• sold by...

J. Neils Lumber Company

Look to the West for transmission and telephone poles... To western Montana, where much of America's finest virgin timber is located...To the J. Neils Lumber Company plant at Libby.

Long a quality manufacturer of forest products (since 1895) J. Neils is a major producer of power and telephone poles.

At Libby, Montana, in the heart of a great forest empire, J. Neils manufactures and treats the poles that come from magnificent stands of Western Larch, Lodgepole Pine and Douglas Fir. This modern pole treating plant measures up to the highest quality standards in men, materials, equipment and methods.

An illustrated folder on J. Neils treated poles, and information regarding their application to your requirements, will be furnished gladly on request.

J N **J. Neils Lumber Company**

Pole Division: LIBBY, MONTANA

type brush holders. It is of totally enclosed construction with leads brought out through packing glands and protected by heavy hose.

Armature winding uses slot wedges of class B material, and windings with class B insulation for protection against hot spots resulting from high peak currents. Low inertia armature permits rapid acceleration and deceleration. Flanges can be provided for mounting on any type of down-coiler.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

•

Thermal Sensitive Resistor

Metal ceramics used for thermistors experience a sharp drop in electrical resistance as temperature increases.

They appear to be especially adaptable as sensitive elements in flow me-

ters, liquid level indicators and controls, time delay relays, voltage regulators, switching devices, and other types of indicators and controls.

Carboloy, Detroit 32, Michigan.

•

Electronic Magnetizer

Complex assemblies such as p-m motors, meters, magnetic pulleys, etc. can be magnetized after final assembly with the model LG5 ignitron controlled magnetizer.

Features include automatic voltage

regulation, adjustable intensity of magnetization, remote control and automatic timing of magnetizing pulses.
Leo Klein-Electronics, 2404 South La Brea Ave, Los Angeles 16, Cal.

MORE NEW PRODUCTS
about which you should know

The Barry Corp, Watertown 72, Mass., has added new **unit vibration isolators** to existing line. New load ranges are 8 to 16 lbs, 14 to 25 lbs, and 22 to 35 lbs. Units are "ruggedized" to withstand severe shock and are claimed to be unaffected by very extreme temperature.

Mitchell Mfg Co, Chicago, Illinois, has developed **a slimline spotlight** which adapts itself to lighting merchandise and displays. Compact and versatile, lamp has a gimbel ring to permit easy adjustment of light in any direction. Entire unit is 20 gage steel and is finished in hard baked white enamel. . . . Stevens Mfg Co, Inc, Manfield, Ohio, has added a thermostat featuring an electrically independent **bimetal thermal element,** designed for use where moisture beads or other severe conditions preclude the use of ordinary thermostats. Hermetically sealed in a CR-7 crystal can with terminals and leads covered with neoprene, design provides complete protection from moisture or contaminants yet allows rapid response characteristics. Units are permanently precalibrated for a range from 400F to −60C.

General Control Co, Boston 34, Mass., has developed for industrial use a new **maintained position switch,** the Type A-C-O switch. Applications for this alternate-contact-operating switch are on machine tools, circuit transfer of timers and recorders, in safety circuits, and as a limit switch. Contacts are rated 20 amps, 125 v ac, non-inductive. . . . Betterby, Inc, 230 Fifth Ave, New York, now makes available a **new powder lubricant** that works like graphite but eliminates the dirtyness of graphite. Not an oil, it will not freeze or soil, and is easily applied with a new type refillable rubber applicator. It can also be blown into any moving part or can be mixed with lubricating oil.

Now! A HEAVY-DUTY, 4-WAY EXPANDING EARTH ANCHOR FOR POWER TRANSMISSION AND HEAVY DISTRIBUTION LINES

This new P-L 4-way All-Steel, Expanding Earth Anchor is designed for use on power transmission and heavy distribution lines . . . 10″ diameter—projected area 200 sq. in. expanded with nominal holding power classification of 20,000 pounds . . . Incorporates ALL the features of the smaller 2-way and 4-way anchors—features proven by use in the past few years in over a million installations . . . Exceptionally rugged and possessed of tremendous holding power, P-L 4-way Anchors are easy to install. A few blows from the spreading tool and the installation is complete, with four blades spread deeply into solid, undisturbed earth. P-L 4-way Expanding Anchors tend to position themselves in soil containing rocks or other obstructions thus greatly improving holding power. Solve your guying problems by installing P-L Anchors. Write today or contact your preferred distributor for information and literature. PLB1-1

PIEPER-LILLARD, inc.
ST. LOUIS 22, MISSOURI
MAKERS OF P-L 2-WAY ANCHORS • WIRE STRINGING PULLEYS • LAY-UP GINS • CHAIN BINDERS • SPREADING TOOLS • SADDLE ASSEMBLIES

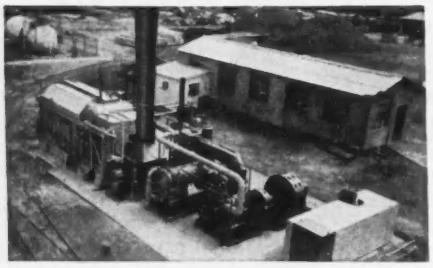
DRAFT FANS GO on GREEN

Packaged Boilers Deserve Good Fans, Too!

Sound engineering talents and careful construction go into the many stack supporting draft fans we have designed for the so-called "packaged" boilers. In some ways, engineering faces more difficult design problems because of the utmost efficiency required in a relatively small space.

Green Stack Supporting Draft Fans are practical, too. They are readily accessible for inspection and maintenance. Shafts and wheels are removable endwise without disturbing the stack or other structural members.

To those manufacturing "packaged boilers" or to those operating them with fans that don't seem to be doing the proper kind of a job or where maintenance seems too high, we offer the services of our experienced fan engineers to (1) design fans suitable for the boiler or (2) study the problem and recommend the remedy.



Our New Bulletin 168 gives details of our Stack Supporting Draft Fans. Write for a copy.

THE GREEN Fuel Economizer COMPANY INC.

BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

WHAT THEY'RE SAYING
at industry meetings

Government Economy

Charles Sawyer, *Secretary of Commerce, before the annual advertising and sales promotion conference of Ohio State University*

Government economy can be effected only by eliminating some of the government activities. Some steps which should be taken are:

1. Place all government expenditures on calendar year rather than fiscal year basis

2. Reduce the vast number of appropriations given to one department

Some incentive must be given government department heads to save money, rather than an incentive to spend it. Allow department heads to distribute "across the board" cuts where they see fit.

Federal bookkeeping and budget-making should be improved by separation of the capital accounts from the operating accounts.

Government employee relations should be improved. The Civil Service system should be overhauled, in order to eliminate unnecessary spending.

The backbone of a capitalistic system is government credit, and the best way to destroy this form of government is to debauch its currency.

Expanding Power Needs Bring Problems

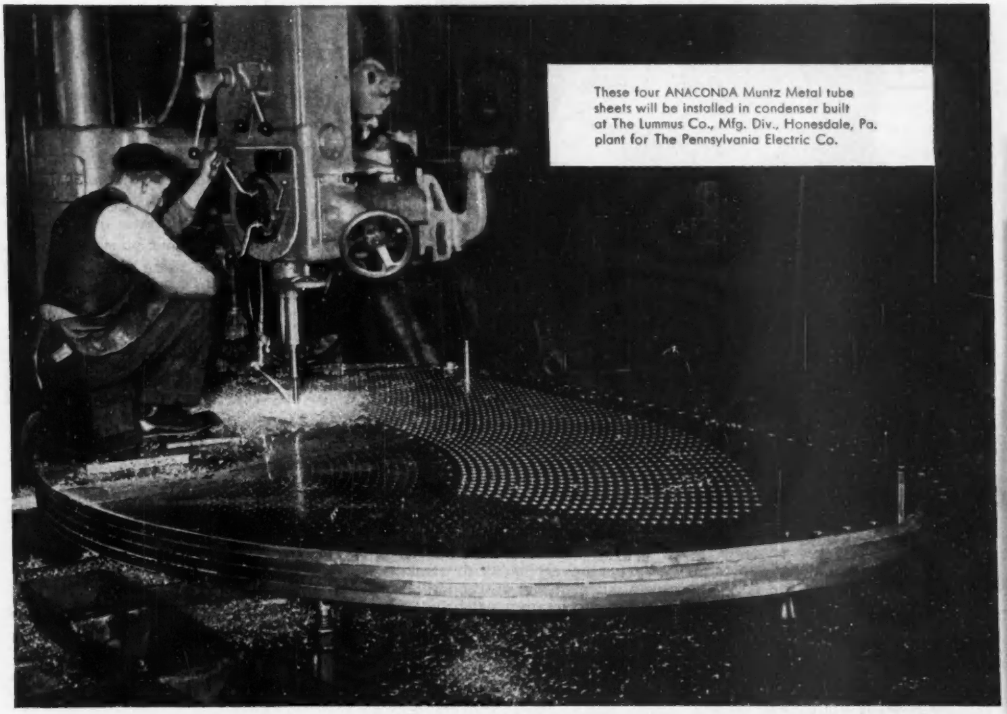
Oscar L. Chapman, *Secretary of Interior, before National Press Club, Washington, D. C.*

The power industry had a capacity of 69,000 Mw at the end of 1950. By the end of 1953 the capacity is expected to be 96,000 Mw.

The demand for electric energy is increasing as fast as programmed expansion. Material shortages may slow down expansion of capacity, while bad water conditions subtract from the effective capacity we already have.

Controlled materials, especially steel, copper, and aluminum, are needed by utilities 12 to 24 months prior to in-service dates. Material requirements have slowed the power program, and the power supply picture for 1952 looks darker than at any time during World War II.

8 tons of ANACONDA → Plates for 37,000 sq. ft. Condenser



These four ANACONDA Muntz Metal tube sheets will be installed in condenser built at The Lummus Co., Mfg. Div., Honesdale, Pa. plant for The Pennsylvania Electric Co.

The four ANACONDA Muntz Metal plates for tube sheets, here being drilled, will be used in a new low-headroom surface condenser at the Front St. Station of the Pennsylvania Electric Co. at Erie, Pa. This space-saving condenser, of special design, has 37,000 sq. ft. surface area and was engineered and built by The Lummus Company, Manufacturing Division.

ANACONDA Muntz Metal was selected as the most practical, economical tube sheet alloy for the particular service conditions at this Erie installation. Rolled at The American Brass Company's Detroit mill, each of these sheets weighs 4,000 lb. and measures 140″ x 92″ x 1¼″. They are typical of the plates which Anaconda mills have fabricated for so many of the largest power installations in the country.

Plates and tubes for condensers and heat exchangers are an Anaconda specialty. Our Technical Department's service and experience are freely available to you in the selection of the proper alloy for any heat exchanger use. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. B1116

for efficient heat transfer

ANACONDA® HEAT EXCHANGER TUBES

on a business tour... his investment's secure

With today's extended delays in replacements, dollars mean less and less protection, when fire strikes. No chance of extensive cutbacks in vital production, loss of day-to-day revenue or decrease in customer good will, when your investment in materials, equipment and buildings is fully protected from the ravages of fire with efficient, quick-acting C-O-TWO Fire Protection Equipment.

No matter what your property . . . factory, mill, warehouse, power station or research center . . . or a particular fire hazard such as spray booth, dip tank, pump room, electrical equipment enclosure or record vault . . . there is a type of C-O-TWO Fire Protection Equipment that gives you fast, positive action the instant fire strikes. Whether it's a C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguisher for an incipient fire, or a C-O-TWO Built-In High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing System for total flooding an entire fire hazardous area . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

For example, at many locations a C-O-TWO Combination Smoke Detecting and Fire Extinguishing System is a "must." The first trace of smoke in a protected area sounds an alarm . . . then fast, clean, non-damaging, non-conducting carbon dioxide blankets the fire, putting it out in seconds, before it spreads and causes extensive damage . . . no after fire mess, no water damage with carbon dioxide.

So, whatever your fire protection problem, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today . . . tell us about your particular fire hazards . . . no obligation.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

Low water in the Northwest has compelled Bonneville to reduce power to customers served under interruptible power contracts. Construction of steam plants in this area would in no way detract from the need for continuing an adequate construction program.

The power shortage is growing in the Southeast, where low water conditions have kept Cooper-Santee reservoir in North Carolina 42 percent below average level for 21 months. Consequently, power supplied to an essential aluminum producer has been curtailed.

Atomic Energy for Peace Time Use

George R. Prout, *vice president of General Electric Co, before a meeting at the company's Hanford Works operation for the A.E.C.*

Present world conditions will probably prevent full development of atomic energy for peace time use for a long period of time, possibly 20 years.

Despite the rising costs of material and labor, the unit cost of plutonium has been reduced by more than 50%.

The General Electric Co has spent about $300 million to rehabilitate and expand its Hanford Works, and this work is continuing at the rate of $7 million a month.

Engineer Shortage

Dr. Jess H. Davis, *president, Stevens Institute of Technology, before the Montclair Society of Engineers*

It appears doubtful that the engineer shortage will improve in the near future, as the number of high school graduates studying engineering is decreasing. The reasons for this are:

1. Poor guidance policies of high schools
2. Loss of engineering type instructors to both the war and to industry
3. Department of Labor report two years ago which predicted an engineering shortage

Of the 12,000 engineering graduates expected in 1954, possibly half will be lost to the military. In the next four years, there probably will not be enough technically trained personnel to run our industry.

The engineering profession itself must promote the study of engineering by capable high school graduates. Industry must make the best use of engineers, and also promote on-the-job training.

"Some 15,000 employees in all branches of our organization are taking advantage of the Payroll Savings Plan..."

SPENCER LOVE
Chairman of the Board, Burlington Mills

"The Payroll Savings Plan is one of the important personnel services offered to the employees of our company. At the present time some 15,000 employees in all branches of our organization are taking advantage of this splendid plan for systematic savings. In times of national emergency this plan assists in stabilizing the economic life of the employee, the community and the nation."

Last call for the 1951 Defense Bond Campaign!

While the campaign was scheduled for six weeks, beginning Labor Day, the *accounting period* will include all Payroll Savings Plan bond purchases and enrollments in September *and October*.

If *you* haven't conducted a person-to-person canvass to put a Payroll Savings Blank in the hands of every man and woman in *your* company there is still time to join the thousands of companies which have added nearly a million employees to the Payroll Savings Plan through person-to-person canvasses.

Phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will give you all the help you need—application blanks, posters, envelope stuffers, personal assistance.

Give your employees an opportunity to save for their future and at the same time, help to maintain America's economic security—put an application blank in their hands.

Results of a few recent person-to-person canvasses

Firestone Tire and Rubber Company (40,000 employees), 87% participation; Universal Atlas Cement Company, 67.8% of 4,789 employees . . . Martha Mills, 71% of 2,200 employees . . . Lit Brothers, 52% of 3,600 employees . . . Delta Air Lines, 65% of 2,100 employees; Aerojet Engineering Corporation, 78.1% of 2,000 employees . . . Brown-Lipe Chapin Division of General Motors, 87% of 1,750 employees; Fabricast Division, General Motors, 85% of 1,700 employees.

Person-to-person canvasses now under way include:

	Number of Employees
38 Major Railroads	993,142
Radio Corporation of America	40,000
Owens-Illinois Glass Company	25,000
Cudahy Packing Company	17,000
Pacific Gas and Electric	17,000
Willys-Overland	6,750
Owens-Corning Fiberglas Corp.	6,500
White Motor Company	6,500
Fruehauf Trailer Company	5,700

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

ELECTRICAL WORLD

NEWS ABOUT PEOPLE

Kansas City P&L Names Ernest L. Godshalk a VP

Ernest L. Godshalk has been appointed to the newly created position of vice president in charge of operations at Kansas City (Mo.) Power & Light Co. He formerly was executive

E. L. GODSHALK

vice president and a director of South Carolina Electric & Gas Co.

Godshalk started his utility career with the Charleston Consolidated Railway & Lighting Co in 1917, remaining until 1919 when he went to Pennsylvania as distribution engineer in the electric department of Counties Gas & Electric Co, Norristown, Pa., an affiliate at that time of Charleston Consolidated R&L. He returned to Charleston as superintendent of the electric department in 1922, becoming manager of electric operations of the successor utility, South Carolina Power Co, in 1929, a vice president and general manager in 1932, and president and general manager in 1936. South Carolina Power was sold to South Carolina E&G by the Commonwealth Southern Corp in 1948 and when the two companies were merged in 1950 Godshalk was named executive vice president.

•

G. Fred Cook, Jr, manager at Virginia Beach since 1944 for Virginia Electric & Power Co, has been named director of residential sales for the utility's entire system. He succeeds **Francis K. Godwin,** who recently resigned. Cook joined Vepco's Richmond office in 1927 and has served as student engineer, transportation salesman, assistant to the division sales manager and division lighting engineer in Richmond, and sales manager at Fredericksburg, Suffolk and Portsmouth.

•

Westinghouse Promotes Henderson and Albracht

Westinghouse Electric Corp has named Stanley D. Henderson steam superintendent for its engineering and service department in the New England district. In this capacity he will supervise the installation and servicing of power generating equipment as well as propulsion apparatus for Navy and cargo vessels.

The company also named Carl E. Albracht manager of the Western Publicity Division with headquarters in San Francisco. He replaces Charles P. Johnson who was transferred East recently to become manager of the Eastern Publicity Division in New York.

Henderson, who has been Westinghouse's service consultant to the U. S. Navy in New England since 1941, first joined the company in 1920 as a technical apprentice at the South Philadelphia Works. He has served as steam service supervisor for the New England district since 1939 and, in addition, port engineer since 1945.

Albracht has been in charge of public relations for Westinghouse's Lamp and Electric Tube Divisions for the past eight years. Prior to joining the company in 1942, he worked for the Associated Press.

•

C. J. Luten has been appointed editor of "Sylvania News" by Sylvania Electric Products, Inc. He succeeds **Robert A. Penfield** who has been promoted to advertising and sales promotion supervisor. Luten joined the advertising department of Sylvania in July of this year.

Witts, Peterson Advanced by Northern States Power

Northern States Power Co, Minneapolis, Minn., has named Seth N. Witts system planning engineer and Donald C. Peterson superintendent of

S. N. WITTS

D. C. PETERSON

system operation in the generation department.

Witts, who has been superintendent of system operation, started with Northern States Power in 1925 while a student at the University of Minnesota. He worked nights as assistant to the load dispatcher. Upon graduation in 1927, he was assigned to the general technical staff of the generation department as assistant engineer. He later became electrical production engineer and in 1942 was made system operating engineer. The follow-

FIVE MILLION POUNDS ...ON A TEACUP

This is one of a series of Lapp tower footing insulators built to insulate and support radio antenna towers of heights up to 1250 feet. The assembled part, as shown here, was design-tested at 5,000,000 lbs.—to those who are inclined to look on porcelain as "fragile," a staggering load indeed, to be carried by a 32½-inch "teacup" with a wall thickness of only 2½ inches.

It was in 1924 when the suggestion was made that a cable strung between two towers could be replaced as a radio transmission antenna by a single tower itself, with greatly superior performance—*if* the tower could be insulated. At this time, Lapp conceived the idea of porcelain cones carrying immense loads. Since then, most large radio towers around the world have been insulated by Lapp insulators in a variety of designs—but all incorporating the Lapp "compression cone."

The compression cone was born of a confidence in, and knowledge of, the great mechanical strength of porcelain as a material—but a strength which could be developed only in a part properly designed to load it only in compression—in which it is five times as strong as it is in tension.

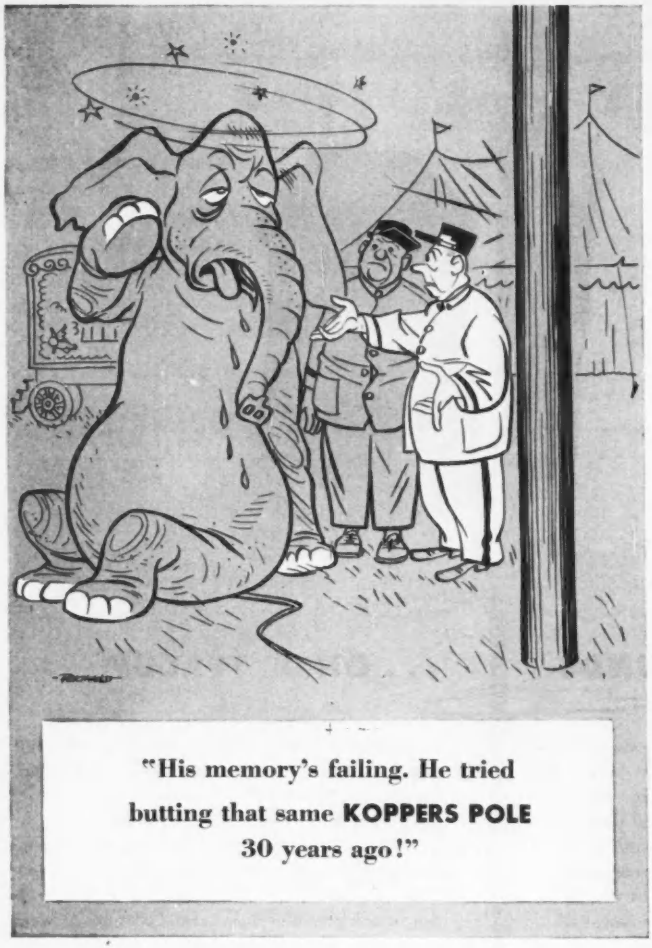
Basic to the strength of this compression cone—as of other high-strength Lapp insulators—is the *external attachment* of hardware, a design conception which provides that thermal changes between parts, as well as external loading, load the porcelain in compression.

It's the same design conception as that of the Lapp Line Post and Station Posts insulators, and a reason why these externally-attached-hardware insulators so greatly out-perform multi-part internally-attached-pin insulators.

It's one of the many Lapp-originated design and production improvements that add up to greater operating security of electrical systems on Lapp insulators . . . to longer life . . . to lower upkeep and maintenance.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp



● From now on, this puzzled pachyderm should certainly know that Koppers Poles are strong—*and that they stay strong.*

For different reasons, of course, Line Supervisors also know that Koppers Poles retain their strength. To these experts, this strength-retention means: 1) Less maintenance work; 2) Lower maintenance costs; 3) Fewer pole replacements; and 4) Longer periods of continuous service.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

KOPPERS PRESSURE-TREATED WOOD

ing year Witts was appointed superintendent of system operation and also was given charge of the system load dispatching office in Minneapolis.

Electrical production engineer for the last six years, Peterson joined Northern States Power in 1937 as assistant engineer in the generation department. In 1941 he was transferred to the system operating section of the department as assistant electrical production engineer. He was made electrical production engineer in 1945.

•

James F. Lincoln Elected New President of NEMA

James F. Lincoln, president and general manager of the Lincoln Electric Co., Cleveland, Ohio, has been elected president of the National Electrical Manufacturers Association. He succeeds Clarence W. Higbee, United States Rubber Co.

J. F. LINCOLN

The following vice presidents were named at NEMA's recent 25th annual meeting (EW, Nov. 26, p 12): Arthur A. Berard, Ward Leonard Electric Co.; J. W. Corey, Reliance Electric & Engineering Co; J. H. Jewell, Westinghouse Electric Corp; Alan F. Sheldon, Kennecott Wire & Cable Co; and Hoyt Post Steele, Benjamin Electric Manufacturing Co.

Lincoln started his career with the Lincoln Electric Co, which was founded by his brother, John C. Lincoln. In 1912 he became general manager of the company and later was made vice president. In 1929, he was elected president.

•

Karl H. Meyer, manager of Reliance Electric & Engineering Co's Ashtabula, Ohio, plant since 1947, has

We need 3000 Carloads of Scrap a Day

Every pound of dormant scrap you can furnish will help to keep the steel mills and foundries producing

Steel mill furnaces are gobbling up scrap faster than it's being delivered. To maintain planned schedules of steel production for both military and civilian purposes, the mills must have *more* iron and steel scrap.

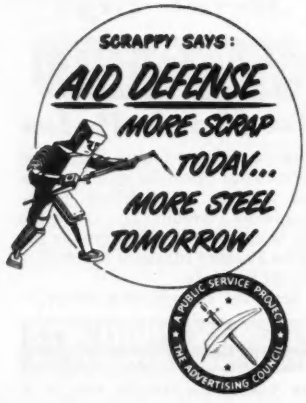
Get in the Scrap—Yourself!

Whatever your business, you undoubtedly have scrap. If there's dust on it or rust on it—it may be scrap. If it's scrap—it's *needed*.

Turn it over to your local scrap dealer and help lick this critical scrap shortage.

What you can do to help

1. Appoint one top official in your plant to take full responsibility for surveying the plant and getting out the scrap.
2. Consult with your local Scrap Mobilization Committee about its program to help out in the scrap crisis. The nearest office of the National Production Authority, Department of Commerce, can tell you who your local Scrap Mobilization chairman is.
3. Call in your local scrap dealer to help you work out a practical scrapping program. Non-ferrous scrap needed, too!
4. Write for free booklet, "Top Management: Your Program for Emergency Scrap Recovery", addressing Advertising Council, 25 W. 45th St., N. Y. 19.



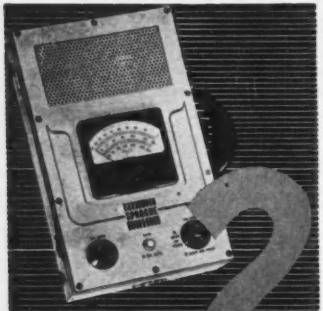
FACTS YOU SHOULD KNOW ABOUT STEEL PRODUCTION

Steel production	1950	97,800,000 net tons
Estimated capacity	1952	119,500,000 net tons
Purchased scrap used*	1950	29,500,000 gross tons
Estimated purchased scrap requirement*	1952	36,200,000 gross tons

*All consumers

This advertisement is a contribution, in the national interest, by

McGRAW-HILL PUBLISHING COMPANY, INC.
330 WEST 42nd STREET NEW YORK 18, N.Y.



DON'T GUESS ABOUT WIRING!

SPRAGUE'S NEW

ADEQUATE WIRING ANALYZER

- Makes it quick, simple and easy to check existing wiring to see if it will safely carry proposed loads or if it is adequate for present loads. An effective visual convincer for your customers!

- Reads percent voltage drop under load directly on 115 or 230 volt circuits. Has direct-reading voltmeter for 115 and 230 volt lines.

- Furnished complete with connectors for convenience outlets, electric ranges, panel boards, etc.

Write for Bulletin PF-600

SPRAGUE ELECTRIC COMPANY

North Adams, Mass.

been promoted to manager of the company's Ivanhoe Division. He will make his headquarters at Cleveland. **Walter H. Haber,** superintendent of the Ashtabula Division, succeeds Meyer at the plant. With Reliance since 1926, Meyer has served as superintendent of the Marine Division and later as manager of the division. Haber also joined Reliance in 1926 and became supervisor of production planning of the Marine Division and then production manager. In 1947 he went to Ashtabula as production manager and was appointed superintendent of the Ashtabula division in 1950.

W. H. Prewitt, Jr, has been appointed manager of Wagner Electric Corp's Electrical Division branch office in Atlanta. He succeeds **L. C. Barton** who is retiring. Prewitt started with the company as a student engineer in 1935 and went to the company's Cincinnati branch as a salesman the following year. He was transferred to Atlanta early this year. Barton joined Wagner in 1934 and became Atlanta manager in 1938.

Leland B. Smith, has been named manager of Texas Power & Light Co's McKinney district.

•

GE Advances Newman; 2 Others Get New Posts

General Electric Co has appointed Louis E. Newman manager of marketing for the Large Steam Turbine and Generator Department. He has been superintendent of manufacturing for the Schenectady Turbine Division.

In other appointments the company named A. W. Bartling manager of product sales practices for the Apparatus Sales Division and James R. Squires manager of advertising and sales promotion for the Atlantic District of the division.

Newman joined GE in 1929 as a student engineer on the test course. Two years later he went to the Lynn, Mass., plant where he held various assignments in turbine engineering and sales operations. In 1938 Newman became senior proposition engineer in turbine sales at Schenectady. Returning to Lynn in 1945 he served as general assistant to the manager of sales for Lynn turbines and the following year became assistant manager of Lynn turbine and gear sales. He was made superintendent of manu-

LOOK... FOR THE YELLOW TRIANGLE -

a symbol of Wickwire Quality when you're buying wire rope. It's your assurance of utmost stamina and uniformly dependable performance...longer, more economical service on the job.

Write for free copy of "Know Your Ropes" —82 pages of helpful information on selection, application and correct usage of wire rope. Address your request to: Wire Rope Sales Office, Palmer, Mass.

The Colorado Fuel & Iron Corporation, Denver, Colorado
The California Wire Cloth Corporation, Oakland, California
Wickwire Spencer Steel Division, Palmer, Massachusetts

WICKWIRE ROPE
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION (CF&I)

BRANCHES IN ALL KEY CITIES

PREMAX

DON'T Stencil

Use Stamped Metal Tags

·ABC Co·

To Mark Poles

Premax Stamped and Embossed Metal Tags offer the real economical method of marking poles, cross-arms, circuits, etc. Once the job is done, it's done forever because Premax Markers invariably outlast the pole.

Send for sample and prices.

PREMAX PRODUCTS
DIVISION CHISHOLM-RYDER CO., INC.
5247 Highland Ave., Niagara Falls, N. Y

facturing for the Schenectady Turbine Division last year. Newman is a winner of the Charles E. Coffin Award, GE's highest award to employees.

Bartling started with GE in 1919 as a student engineer at the firm's Fort Wayne, Ind., Works. He was named assistant manager of the fractional horsepower motor section of the former Motor Divisions at Fort Wayne in 1931. Three years later he was appointed manager of sales of the Fractional-Horsepower Motor Divisions and remained in that post until 1950 when he was made general sales manager for Small Apparatus Division products.

Squires became associated with GE in 1941 and served on various production assignments at the Fort Wayne Works. Two years later he entered the armed services and after discharge from the Army studied journalism at Northwestern University. Rejoining GE in 1948, Squires subsequently served on the advertising training course of the Apparatus Sales Division and as a project supervisor in the planning of the "More Power to America Special" exhibit train. Since 1949 he has been supervisor of Apparatus advertising distribution.

OBITUARY

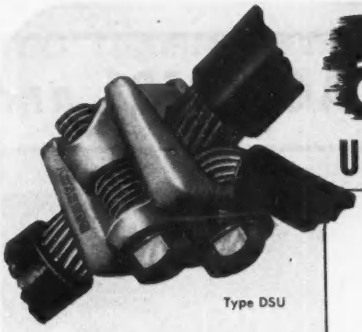
Charles F. McCann, 47, district operating superintendent of New York State Electric & Gas Corp in the Geneva district, died Nov. 11. He had been promoted to his new position only a few months ago. Since 1946 he had served as superintendent at Hornell.

James Sherman Gault, 52, professor of electrical engineering at the University of Michigan, Ann Arbor, Mich., died Nov. 16. He had been a member of the faculty since 1922.

Col Truman Ripley Hawley, 75, specialist in public utility and power company legislation and former counsel of Hudson Niagara Power Co, died Nov. 15 at Brooklyn, N. Y.

Ransom O. Pratt, 87, retired turbine engineer for Ohio Edison Co, died Nov. 5. He worked 47 years at the company's plant in Cuyahoga Falls.

L. I. King, Denver sales representative for The Okonite Co, died Nov. 2. He joined the company in 1930.



Type DSU

DOSSERT Connectors

UNEXCELLED!

FOR QUALITY... DEPENDABILITY... PERFORMANCE...

AT LOW COST

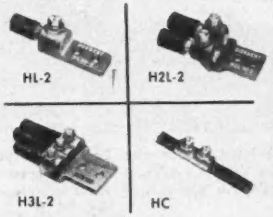
DOSULON

A one-piece bolt type variable service tap. For large size copper cables. Available in conductor sizes from 1/0 to 1,000 MCM. Made of high strength copper alloy and equipped with Duronze bolts. Rugged, compact, facilitates neat taping.

WRITE FOR CATALOG 45-I

VARIABLE HERCULON CONNECTORS

For power distribution jobs. Available in eight sizes to cover range of cable No. 8 solid to 1,000 MCM.



HL-2 H2L-2 H3L-2 HC

DOSSERT MFG. CORP.

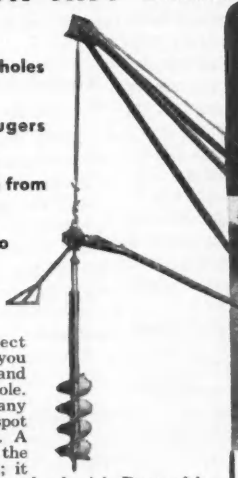
849-855 HURON STREET, BROOKLYN 22, N. Y.

SINCE 1904

Operates **ON ANY DERRICK TRUCK**

TEL-E-LECT POLE HOLE DIGGER

- **Adjustable for clean holes to 10 ft. deep**
- **Interchangeable augers 8" to 20" diameter**
- **Drills a straight hole from any truck position**
- **Easy to use—easy to transport**



WITH the Tel-E-Lect Pole Hole Digger, you use the same truck and crew that sets the pole. You can drill a hole any place that you can spot the pole derrick. A single bolt attaches the digger to the truck; it works suspended from the derrick. Powered by the truck motor through a power take-off shaft, Tel-E-Lect digger is raised and lowered by the winch line. Fits the budget of even the smallest utility or contractor, and quickly pays for itself.

Send For Specifications Bulletin

Rear or Front Mounted

TEL-E-LECT PRODUCTS, Inc.

10003 MINNETONKA BOULEVARD, MINNEAPOLIS 16, MINNESOTA

MANUFACTURERS and MARKETS

FIRST BOARD OF DIRECTORS MEETING of Elliott Co, Jeannette, Pa., held 50 years ago, is reenacted by members of the company's Veterans Association. The presentation was part of Elliott's celebration of its 50th anniversary observed recently

Refined Copper Stocks Increased During October

Stocks of refined copper held in the United States by members of the Copper Institute at the end of October totaled 78,192 tons, an increase of 16,099 over the 62,093 tons held on Sept. 30.

During October deliveries to domestic fabricators increased to 125,286 tons, compared with 121,879 in September. These figures include tonnages delivered from government stocks. Refined production rose sharply in October to 104,148 tons from 74,354 a month earlier.

Outside the United States refined stocks amounted to 170,477 tons on Oct. 31, an increase of 6,939 over the 163,538 held on Sept. 30. October deliveries rose to 89,495 from 74,131 in September and refined production was 115,825 compared with 101,133.

•

Plant to Begin Operations

Production at Brown Boveri, Ltd's St. Johns, Quebec, plant now under construction is expected to begin this month. The company is a subsidiary of the Swiss firm of the same name. Initial production at the new plant will include distribution and power transformers, air blast circuit breakers, and switchboards.

•

Aluminum-Copper Metal, Alcup, Is Now Available

Alcup, formerly known as Cupal, is now available in the United States. Eastern Brass & Copper Co, New York, the American distributor, has received its first shipment from the West Zone in Germany. First deliveries are expected to go to manufacturers for experimental purposes. Larger deliveries later will find their way to the commercial market.

The metal consists of aluminum with a layer of copper welded to one or both sides and rolled to specific thicknesses. At present the maximum width is 23 in., length 8 ft, gauges between .010 and .118, tempers—soft, half-hard, and hard. The market price is expected to be slightly higher than pure copper.

Many electrical applications are expected as the company asserts the conductivity of Alcup at higher frequencies is practically the same as that of pure copper.

Rensselaer Poly Patents Fast Metal Test Method

A rapid and accurate way for testing steel alloys, other metals, and plastics to find out how long they will stand up under normal loads when they are used for making moving parts of machines has been discovered.

Dr Joseph L. Rosenholtz and Prof Dudley T. Smith, Rensselaer Polytechnic Institute, designed the apparatus which completes in ten hours or less jobs which have been taking three months or more.

The inventors call their discovery the Dilastrain Method. It is based on precise measurements of the extent to which specimens will expand under controlled temperatures. Rensselaer, which holds the patents, will make the method available under a licensing plan.

Applications of the method include turbine blades, revolving shafts, and other dynamic parts.

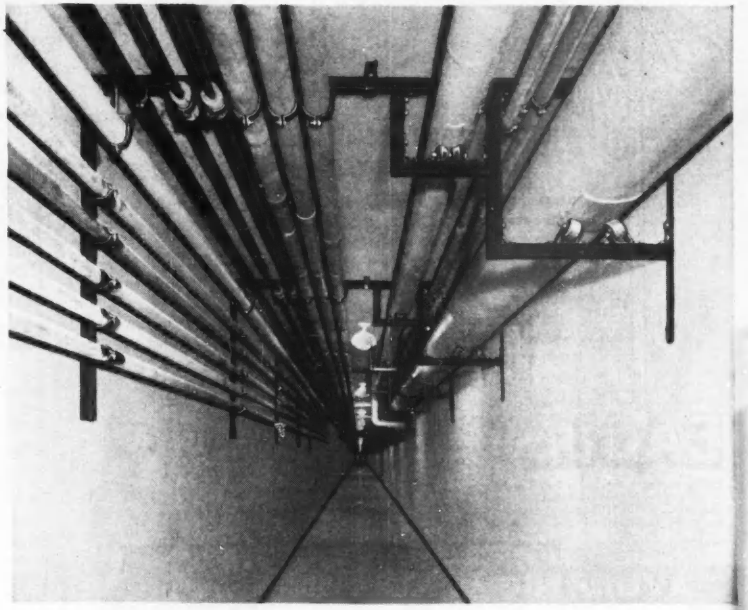
MANUFACTURING BRIEFS

Victor Insulators, Inc, Victor, N. Y., has placed into operation a new building adjoining its Victor plant. The structure, 45 ft by 200 ft, will allow expansion of the company's glazing and inspection departments, provide greater storage facilities, and expedite loading and shipment of finished insulators.

Bechtel Corp, Bechtel International Corp, and an affiliate company, George S. Colley, Jr, & Associates, construction and engineering firms, have leased the 19th floor of Chrysler Building East in New York City. Bechtel maintains headquarters in San Francisco and has offices in Los Angeles, Washington, and New York. George S. Colley, Jr, will make its main offices at the Chrysler Building East.

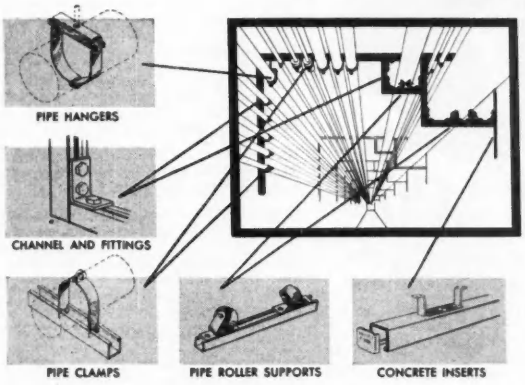
General Electric Co has been awarded a contract to supply three 42,220-kva generators and appurtenances for

UNISTRUT® METAL FRAMING SYSTEM DOES THE ENTIRE JOB* FOR PUBLIC SERVICE COMPANY OF INDIANA, INC.



* Tunnel for all services—electric, steam, water, air and oil lines.

Specifications: Noess & Murphy, Architects—Engineers.
Contractor: Gust K. Newberg Construction Company
Electrical Contractor: Hatfield Electric
Process Piping: Hayes Bros., Inc.



In this large main tunnel installation at Plainfield, Indiana, UNISTRUT channel, concrete inserts, pipe rollers, hangers and clamps support electric, steam, water, air and oil lines—all the services in *one neat package!*

This completely adjustable metal framing system provides a new and more flexible type of mechanical support for every kind of piping, conduit and cable. Assures exact slope or pitch. Permits adjustments, changes or additions to be made at any time. No drilling, no welding, no special tools or equipment. The UNISTRUT method conserves steel, reduces manpower hours, cuts over-all costs.

Representatives and Warehouse Stocks in Principal Cities—Consult Your Telephone Directories

Write for NEW FREE Construction Catalog No. 700

UNISTRUT PRODUCTS COMPANY

1013 W. Washington Blvd., Chicago 7, Ill., Dept. W12

Please send the items checked below, without obligation.

☐ New Catalog No. 700 ☐ UNISTRUT Sample
☐ Wall Chart

NAME_____

COMPANY_____

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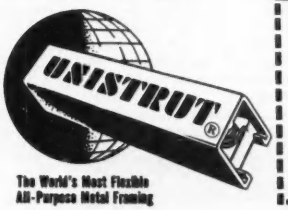
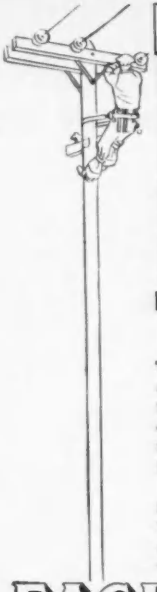
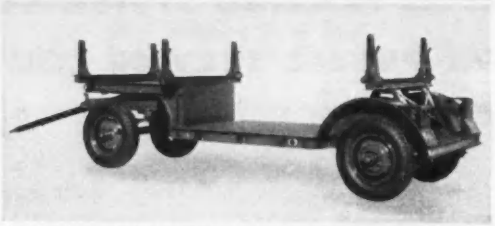
For Defense Production—Every day the value of UNISTRUT products is being proved by their use in Defense Industries and Armed Services installations where flexibility, assembly and erection speed count most.



The World's Most Flexible All-Purpose Metal Framing



DESIGNED TO MEET YOUR NEEDS...in Line Construction and Maintenance



BUILT LOW FOR EASIER LOADING AND HAULING — THE EAGLE 4-WHEEL LO-BED TRAILER

Transformers and other heavy, bulky units are easy to load and carry on this trailer. Big, roomy, low platform. Also suited to pole and general purpose hauling. Full 90° turn with front dolly; 5th wheel type steer. Heavy duty construction; low center of gravity keeps load steady enroute. Equipped with pole bolsters.

5 tons capacity; over-all length, including tongue, 25 ft. 8 inches. Distance ground to low platform only 25-1/2 inches. Weight 5400 lbs. Equipped with electric brakes on rear wheels. Send for complete information on Model 6441—Eagle LO-BED Trailer.

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EAGLE MANUFACTURING CO.
Division of
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Utility Bodies • Trailers • Pole Derricks
Tools and Accessories
Eagle equipment is engineered by and for utility men expressly for their needs

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Send today for the complete catalog of Eagle Line Construction and Maintenance Equipment—a useful reference book.

AVOID NIGHT ACCIDENTS . . .

TWIN LENZ

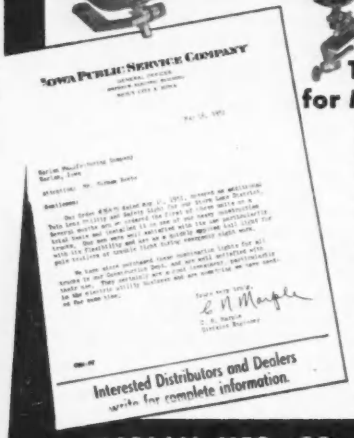
The Double Safety Light for Maintenance Equipment

A double tail light—one stationary and one that extends on 35-ft. electric cable from spring tension pulley drum.

Avoid night accidents and expensive law suits.

Mounts on rear of truck with extension sealed beam red light for coupled equipment . . . makes night flood light when extended on truck booms with red lens raised on simple bracket . . . utility extension light for breakdowns . . . extension red light for road warning.

SAE approved. Recommended by National Safety Council. Write for full particulars. Immediate Delivery.



HARLAN MFG. CO., INC., Harlan, Iowa

Lookout Point Dam power house on the Willamette River in Oregon. GE submitted the second lowest bid. Low bidder was English Electric Co, Stafford, England, which was incorrectly listed as having been awarded contract in the Nov. 12 issue of Electrical World.

SALES ASSIGNMENTS

COMPANY STAFFS

Springfield (Ill.) Boiler Co has appointed A. D. Flower a member of its Springfield sales staff. He will cover eastern Pennsylvania, southern New Jersey, the District of Columbia, Delaware, Maryland, and Virginia. The company also named Delmer Engineers, 902 East Third Street, Los Angeles 13, Calif., its representative for the lower portion of California.

Unistrut Products Co, Chicago, has named Duncan A. Brownlee sales and service contact for the company in the West Coast region. Brad Fogarty has been appointed district manager of the firm's new Southeastern District sales office at 1321 Spring Street, NW, Atlanta, Ga.

Allis-Chalmers Manufacturing Co has assigned Al Chalupnik to its Shreveport, La., district office as a sales representative. He has been with the company as an electrical engineer since 1948.

Cutler-Hammer, Inc, Milwaukee, Wis., has appointed A. J. Shradel manager of its Seattle district sales office. He succeeds T. N. Bristow, who has retired.

Graybar Electric Co has appointed John Reine Minneapolis district manager, effective Dec. 1. Replacing Reine as manager at Portland, Ore., is P. D. Barber. Barber's former post as manager of the Duluth branch has been taken over by F. A. Sjogren. The company also named H. J. Mittelstaedt operating manager of the Flint, Mich., branch.

Electric Service Manufacturing Co has transferred Warren Erbe, sales representative, from Cincinnati to St. Louis.

General Cable Corp, New York, has appointed J. K. Davis district sales manager of its Central District which has offices in Illinois, Indiana, Wisconsin, and Minnesota. Davis will make his headquarters in Chicago. The company also named W. E. Benbow manager of the Buffalo office.

REPRESENTATIVES

Nordberg Manufacturing Co, Milwaukee, Wis., has appointed Eighmy Equipment Co, Rockford, Ill., as distributor for Nordberg 4FS diesel engines in the northwestern and central section of Illinois.

Metal Prices

Nov. 26, 1951

COPPER, Conn., V., lb	$ .24½
LEAD, N. Y., lb	.19
ZINC, prime Western, E. St. Louis, lb	.19½
TIN, Straits, qual. N. Y., lb	1.03
ALUMINUM, ingot, base price	.19
NICKEL, base price	.56½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap, No. 1 heavy, Pitts., ton	45.00

NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

Calif., Port Chicago—Dist. P. Wks., Twelfth Naval Dist., Federal Office Bldg., Civic Center, San Francisco, facilities for inter-connection with Bureau of Reclamation 69 kv transmission line at U. S. Naval Magazine, NOY 28896, Spec. 30516. Plans deposit $10.

Colorado — Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, furnishing, del. f.o.b. cars shipping point or f.o.b. Loveland, Colo., valve, etc. for Flatiron Power and Pumping Plant, Colorado—Big Thompson Proj., Spec. DS 3595. L. N. McClellan, ch. engr.

Ill., Oaklawn—Hotpoint, Inc., 5600 W. Taylor St., Chicago 50, Ill., 1,000,000 sq. ft. factory, $25,000,000. Abell Howe Co., 53 W. Jackson St., Chicago, 4, Ill., consult. engr.

Me., South Portland—Dist. P. Wks. Office, First Naval Dist., 495 Summer St., Boston, Mass., repairing steam distr. sys. at U. S. Naval Reserve Training Center, NOY 29530, Spec. 30312. Plans deposit $10.

Mich., Lansing—City Water & Electric Light Comn., City Hall, electric power plant and equip., incl. addn. to Moore's Park Station, boiler feed pumps, electric control, switching equip., condenser pumps and feed water heaters. $6,000,000. Burns & Roe, Inc., 233 Broadway, New York, N. Y., engr.

Missouri—Sho-Me Power Co-operative, Marshfield, 82.81 mi. rural distr. lines, Camden, Laclede, Webster and Wright Counties, $225,000, Frank Horton & Co., Lamar, engrs.

Mo., Missouri City—Northwest Electric Power Co-operative, Brun S. Gibbs, pres., Cameron, power piping, Lutz & May, 819 Finance Bldg., Kansas City 6, Mo., consult. engrs.

Nebraska — North Central Nebraska Pub. Power Dist., Creighton, rural distr. lines and sys. imprvs., Knox Co. $690,000. Raymond H. Reed & Co., Columbus, consult. engrs.

Nebraska—Bureau Reclamation, Dpt. Interior, P. O. Box 280, Casper, Wyo., furnishing, del. power circuit breakers and disconnecting switches for Gering and Sidney sub-stations addns., Transmission Div., Missouri River Basin Proj. Inv. No. 703S-224.

North Carolina—At office B. O. Vannort Engineers, Inc., engr., 700 S. College St., Charlotte, 70 mi. rural distr. lines, Rowan, Iredell, Catawba, Lincoln, Gaston, Mecklenburg and Cabarrus Counties, N. C. 45, for Cornelius Electric Membership Corp., Cornelius, N. C. Plans deposit $10.

North Dakota — Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Bismarck, one 169-kva, 13,200- to 120/240 volt, single-phase, 60-cycle, oil immersed, selfcooled outdoor distribution transformer for Bismarck sub-stations, Transmission Div., Missouri River Basin Proj., Inv. No. DS-3598.

Oregon—U. S. Eng., City-County Airport, Walla Walla, Wash., current transformers and grounding equip. for station service generators at McNary Dam, Inv. 52-42.

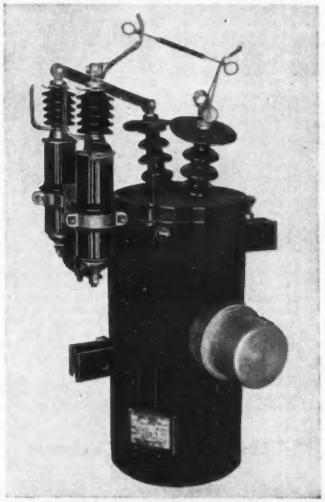
Oregon—U. S. Eng., 628 Pittock Block, Portland, Zone 5, design, mfg., factory testing and del. f.o.b. railroad cars at Lookout Point Dam Powerhouse near Lowell, one 200-ton overhead traveling crane and appurtenances and the services of a supervising erector at the power house. Serial No. CIVENG 35-026-52-117.

South Dakota — Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing four 110- to 69-kv 3-phase autotransformers, from 7,500 to 15,000 kva and each with 12.47-kv tertiary winding for Huron, Mount Vernon, Sioux Falls and Watertown sub-stations, Missouri River Basin Proj., Inv. No. DS-3597.

Wash., Seattle—City, County-City Bldg., Zone 4, 230-kv double circuit steel tower transmission line on Skagit Proj. E. R. Hoffman, city light supt.

SAVE LINE COPPER

REDUCE CUSTOMER COMPLAINTS



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LOW COST
SINGLE STEP
TYPE 1R VOLTAGE
REGULATOR

Low Cost • Pole Mounted • Light Weight (280 lbs.) • Minimum Maintenance • Easily Installed • Will Regulate 300 KVA at 7,200 Volts • 3.75% Boost • Completely Protected •

$427.80 Eastern Zone

With RT&E's new type, light weight pole mounted Regulator, installation can be made on the line where regulation is most needed. *Type 1R Regulators* can be placed in series on the line where more than 3.75% boost is required.

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RURAL transformer & equipment co.
MILWAUKEE WISCONSIN

Test for Electrical
LEAKAGE • SHORTS BREAKDOWN
with
"HYPOT"
JUNIORS
HIGH POTENTIAL TESTING INSTRUMENTS

Write for Bulletin 4A

- **ONLY ONE** instrument necessary to make high potential tests for leakage, breakdown or shorts!
- **PORTABLE,** with rugged steel case . . . Operates in any position!
- **SAFE** to use, with protected test leads, shielded high voltage, grounded case!
- **SIMPLE**—only three easy steps to make a complete test!
- **VISUAL INDICATIONS** from neon lights give positive test results. Audible test indication for leakage also available.
- **RANGES** 0-1500 to 0-6000 V.A.C. output. Other "Hypots" to 50,000 V.A.C. output at 5 K.W.
- **WRITE** for complete data on "HYPOTS" for your jobs.

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SILENT HOIST Equipment
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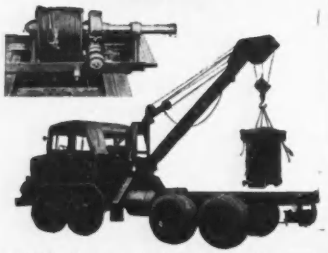
KRANE KAR Swing-Boom Mobile Crane: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING-BOOM CRANES: Truck: Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or racking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—KRANE KAR *No. 70—Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
2½, 5, AND 10 TON CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
862 63rd ST., BROOKLYN 20, NEW YORK

Wyoming — Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing 2 governors with pumping equipment for regulating the speed of 26,500-hp. 163.6-rpm, vertical-shaft single runner, Francis-type hydraulic turbines for Alcova Power Plant, Kendrick Proj., Spec. DS 3594.

Wyoming — Bureau Reclamation, Dpt. Interior, Casper, Wyo., repairing overhead ground wires on existing Seminoe-Casper 115 kv transmission lines, Kendrick Proj., Spec. 3703-C-225. L. N. McClellan, Bldg. 1 A, Denver Federal Center, Denver, Colo., ch. engr.

Wyoming — Bureau Reclamation, Dpt. Interior, Casper, structural steel for Ogallala sub-station, Missouri River Basin Proj., Transmission Division, Spec. 703C-218. L. N. McClelland, Bldg. 1 A, Denver Federal Center, Denver, Colo., ch. engr.

Wyoming—Bureau Reclamation Center, Casper, repairing overhead ground wires on existing Seminoe-Casper 115 kilovolt transmission line, Kendrick, Proj., Spec. No. 703C-225.

Alaska—U. S. Eng., (APO 942, c/o PM, Seattle, Wash.) Anchorage, six 60x150 ft. heated warehouses, $100,000 each; 2 refrigerated warehouses, $130,000 each; family housing, $2,400,000; 4 gas stations, $64,000 each; cold storage warehouse, $85,000; bachelor officers' quarters, $1,500,000; laundry and dry cleaning plant, $2,000,000; automotive maintenance facility, $1,000,000; electronics bldg. $150,000; heavy equipment shop, $250,000; plans by Manley & Meyer, Anchorage communications center, $150,000, all foregoing at Ladd Air Force Base.

Newfoundland, Petrie's—Western Cold Storage Ltd., St. John's, cold storage plant, Bay of Islands Area, $495,000.

Low Bidders & Contracts Awarded

Colorado — Kirkhof Electric Co., 101 Sheldon St., S.E., Grand Rapids, Mich., LB, $87,210, control board and recording board for Flatiron Power and Pumping Plant, Colorado-Big Thompson Proj., Spec. DS 3549, Bureau Reclamation, Dept. Interior, Bldg. 53, Denver Federal Center, Denver, Colo. Bids Nov. 6.

Georgia—Blue Ridge Electric Assn., Young Harris, Ga., Owner Builds, $205,000, 85 mi. rural distr. lines and other imprvs. in Towns Co.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ind., Indianapolis—Guidon, Tenth and Arlington Sts., supermarket $1,000,000.

Miss., Tupelo—Monroe Co. plans by Feemster Connett & Cook, Tupelo, textile plant for Textron, Inc. $2,600,000.

O., Van Buren—Delco Products Div. General Motors Corp., Stevens and E. 1 St., Dayton, Zone 1, factory on 306 acre area. $8,000,000.

Tenn., Lebanon—Firestone Tire & Rubber Co., 1200 Firestone Pkwy, Akron 17, O., mfg. plant, $5,000,000.

Tex., Corpus Christi—Taylor Refining Co., c/o G. L. Rowsey, chn. Bd. Dir., Petroleum Heat & Power Co., Poth Lane, refinery (a benzene purification unit), $3,000,000.

Va., Langley Field—National Advisory Com. for Aeronautics, Langley Field, 17 dormitories, 5 mess halls, airfield paving, fuel storage, communications, lighting, utilities, and storage at Langley Field, $19,282,000.

Newfoundland, Corner Brook—Bowater's Newfoundland Pulp & Paper Mills Ltd., Corner Brook, mill expansion program, Approx. $16,000,000. C. J. Jeffreys, 1115 Sherbrooke St. W. Montreal, Que., engr.

Low Bidders & Contracts Awarded

Calif., Santa Cruz—McNeil Constr. Co., 5860 Avalon Blvd., Los Angeles, Calif., LB, $3,000,000 incl. equipment, Chewing Gum FACTORY, Main St. and West Cliff Dr. Wm. Wrigley Jr. Co., 410 N. Michigan Ave., Chicago, Ill. Bids Sept. 18.

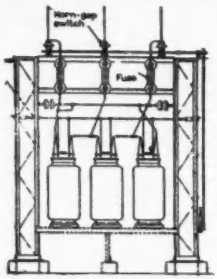
Mass., Boston—John Bowen Co., Inc., 171 Boston St., Boston, Mass. CA $11,179,526. Contr. 2, Chronic Disease Hospital and Nurses Home, Forest Hills. State, Dpt. P. Health, State Hospital, Boston, Mass. Awarded Nov. 13.

All the strength and durability inherent in steel are combined—with definite economies— in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

MEMCO (SINCE 1915)



SUBSTATIONS

OUTDOOR & INDOOR SWITCHES

CONNECTORS

SLEEVES

FITTINGS

MEMCO ENGR. & MFG. CO., INC.
COMMACK, L. I., N. Y.

BOOK REVIEWS

Biography

Herbert H. Dow: Pioneer in Creative Chemistry. By Murray Campbell and Harrison Hatton. Published by Appleton-Century-Crofts, Inc, New York. 158 pages, illustrated. Price $3.50.

Dogged persistence has probably never been manifested to a greater degree in building an American enterprise than by Herbert H. Dow in laying the foundations for what has become one of the three or four biggest in chemistry. Always importuning for funds to build a modest laboratory to produce bromine his early expense accounts showed cash on hand sometimes as low as $2.26. Nevertheless he made "impossible" reactions work, he created a market as well as a product, and he beat the German cartels before the first World War. This is a fascinating recital of minutiae as well as master moves that typify admirably what the American enterprise system really has meant in nurturing the affluence that reaches all the public.

Acoustics

***An Introduction to Acoustics* by R. H. Randall. Published by Addison-Wesley Press, Inc, Cambridge 42, Mass. 340 pages, illustrated. Price $6.**

Sound, music, noise, and acoustics are treated here from the physical and mathematical angle as waves and vibrations. Chapters of interest to utility engineers worried about the measurement and amelioration of station and substation noise will probably be those on 3-dimensional waves, interference patterns, diffraction around obstacles, reflection and absorption, transmission through partitions. Much of the other subject matter deals with acoustics from the viewpoint of the electronic and communication engineer.

Engines

***Internal Combustion Engines.* By L. C. Lichty. Published by McGraw-Hill Book Co, Inc, New York 18, N. Y. 598 pages, illustrated. Price $7.**

This is a sixth edition (first 1915) which represents extensive revision. Replacing obsolete material is subject matter on the gas-turbine, jet, and rocket engines with enlarged treatment of fuels, mixtures, and combustion knock, particularly the permissible range of compression ratios. Chapter subdivisions are (after the thermodynamic foundation) fuels, carburetion, and fuel injection, manifolds, valving, ignition, combustion chamber, lubrication, cooling, vibration, and engine design. A pocket carries 4 thermodynamic charts for design and analyses.

Insulation

***Electrical Insulation: Its Application to Shipboard Electrical Equipment.* By G. L. Moses. Published by McGraw-Hill Book Co, Inc, New York 18, N. Y. 259 pages, illustrated. Price $5.50.**

Hardly any electrical equipment is more rigidly specified than what goes into our naval vessels. Conditions of humidity, vibration, temperature, and accessibility, let alone availability, are usually more severe than encountered elsewhere. This packed-with-information treatment, therefore, deals comprehensively with the detailed characteristics of dielectrics in a manner more thorough and penetrating than if addressed to the general field. Many illustrations from several manufacturers show the applications classified in the text. Winding, testing, and maintenance techniques will likewise prove helpful outside the marine field. This pertains also to the glossary, codings, and many stock-list numbers.

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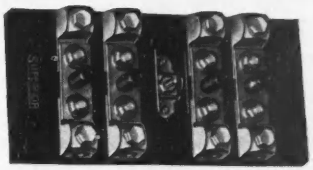

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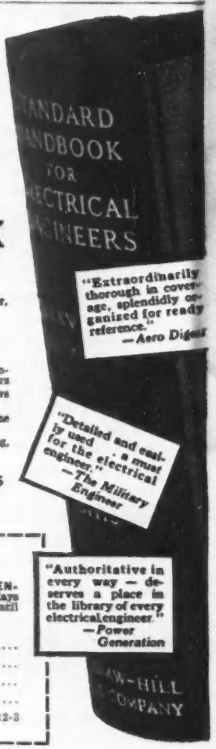
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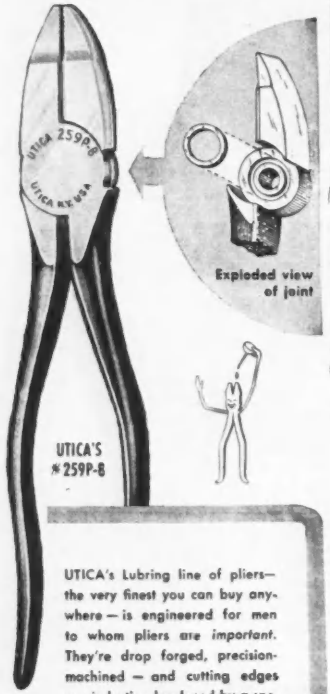

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Sales Conference

(*Continued from page* 146)

290,000 farms every 12 months, according to Dr. Paul W. Chapman, College of Agriculture, University of Georgia.

Whether a utility does or does not merchandise major appliances, a freezer campaign developed to include dealer participation will produce many additional sales that would not be made without this cooperation, said Ed N. Avegno, New Orleans Public Service Inc. In describing a recent home-freezer dealer-utility campaign conducted by New Orleans Public Service Inc. he emphasized the importance of discussing the features with the wholesalers and dealers.

Post Sale Demonstrations . . . "Pay attention to the customer after the sale." This was the advice of T. B. Smiley, Carolina Power & Light Co. He said that post-sale demonstrations by the dealer or the utility's home service staff creates an opportunity to regenerate the enthusiasm the customer had at the time of the purchase.

During March and April of last spring, 105 planned lighting layouts were submitted to customers by the Industrial and Commercial Division of the New Orleans Public Service Inc, according to Harold L. Salaun of that company. A survey of these jobs indicated that by June, 33 had been sold and installed, 56 had not been closed but were still pending and only 16 indicated they were not interested.

Within the last few years more and more electric utilities have found that commercial electric cooking is a desirable and profitable load in the opinion of Luther T. Cale, Birmingham Electric Co.

Radiant Heat Brooding . . . The main advantage of electric radiant heat brooding is the elimination of fire hazards, said E. P. Hyer, Georgia Power Co. This method is fully automatic and it permits cold room brooding. It is much easier to maintain a drier brooder house as there is no combustion with its resultant release of moisture from the air.

Two watts of infrared lamp heat per chick are adequate, according to C. D. Welden, Alabama Power Co in discussing poultry brooding in this area. He said that white chicks require more heat than this since their color reflects the heat.

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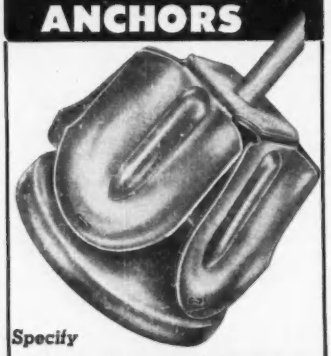

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CATALOGS • BULLETINS

● LIGHTING HANDBOOKS: A series of fluorescent fixture handbooks covering such topics as ballast testing, fixture and ballast noises and how cheaply can a ballast be made are offered for the fluorescent fixture-manufacturer by Precision Manufacturing Co, 210 North Ogden Ave, Chicago, Ill.

● MOTORS: Totally enclosed, fan cooled motors of cast iron construction designed for standard installations and for Class 1 Group D hazardous locations are described in 4-page bulletin. Both types are available in ratings from 2 to 250 HP, with either normal-torque or high-torque characteristics. Illustrations and principal dimensions are included. Bulletin available from Wagner Electric Corp, 6400 Plymouth Ave, St. Louis 14, Mo.

● VACUUM CALCULATOR: A handy slide rule calculator for use in vacuum applications has recently been made available. This calculator is useful in determining the needed pump capacity to evacuate a given volume to a specified vacuum in a given time, and also to determine the time required to evacuate a given volume to a specified vacuum with a known vacuum pump. A conversion table for high vacuums, a chart for boiling points of solvents under vacuum, and vapor pressures of water at various temperatures are all included on the slide rule. Prepared by F. J. Stokes Machine Co, Philadelphia 20, Pa.

● BEARING CATALOG: Engineers and specifiers of industrial roller bearings and mounted units should be interested in Catalog 51 illustrating and describing pillow blocks, flange units, flange cartridge units, cartridge units, duplex units, take-up units, take-up and frame units plus unmounted roller bearings. The advantages of Shafer's ConCaVex design, which consists of concave rollers operating between matched convex races, are fully covered. In addition, complete engineering and load rating data, and illustrations of product application are presented. Copies available from Shafer Bearing Corp, 801 Burlington Ave, Downers Grove, Ill.

● BOILER FEED PUMPS: A description of three types of boiler feed control systems in as many generating plants of Georgia Power Co is presented in bulletin 489 by Northern Equipment Division. Plant Yates features three-influence control through hydraulic couplings of boiler feed pumps. Plant Atkinson has conventional three-influence control using a feed control valve. Plant Arkwright utilizes two-element air-operated control. This 16-page bulletin available from Northern Equipment Div, Continental Foundry & Machine Co, Erie 2, Pa.

● CLASS "H" INSULATION: Technical information on Class H insulating materials for continuous operation at 175C or higher has been prepared by Irvington, Electrical, mechanical properties, standard thicknesses, lengths, widths, and suggested applications for silicone varnished fiberglas, silicone glass mica, silicone saturated and silicone asbestos, silicone rubber coated fiberglas, and silastic tape are covered. Copies of "Irvington Class H Insulation" available from Irvington Varnish and Insulator Co, Irvington 11, N. J.

● REFRACTORIES & INSULATIONS: This new catalog describes refractory and insulating materials used in industrial heat processing and generation. Covered in the catalog are refractory moldit cements, refractory bonding cements, castable refractory materials, plastic fire brick, insulating block, mineral wool blanket insulation, stic-tite plastic insulation, etc. Obtainable from Refractory and Insulation Corp, 120 Wall St, New York 5, N. Y.

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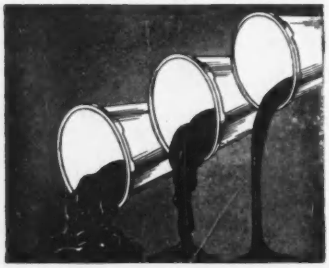

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Computors — A catalog and manual, "GAP/R High Speed All-Electronic Analog Computors for Research & Design" covering origin, development, applications, component philosophy, operating procedures, oscilloscope presentation techniques, choice of scale factors, etc. has been released by George A. Philbrick Researches. Multiple types of components and principles of their operation are also catalogued. Copies available from George A. Philbrick Researches, 230 Congress St, Boston 10, Mass.

Audiometers—American standard specifications for audiometers for general diagnostic purposes sets forth a uniform method of testing Audiometers. This paper describes a standard audiometer and standard procedure for measuring hearing that will give users of audiometers a dependable comparison with the "normal threshold of audibility." Copies of this Standard available at 50¢ per copy from American Standards Association, 70 East 45 Street, New York 17, N. Y.

Chemical Spectroscopy—A 52-page illustrated booklet which discusses the development and use of spectroscopic methods in analytical control has been issued by the Bureau of Standards. Use of emission spectra and absorption spectra procedures are outlined as are methods in colorimetry and color description. Recent advances in photoelectric recording instruments are discussed. Copies may be obtained from American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa at $1.35 each.

Technical News Bulletin—This publication is issued by Bureau of Standards monthly. It contains articles of technical and general interest to engineers and scientists. A number of latest NBS standards are included in each issue. Some articles in the August issue discussed a magnetic attenuator, air gravel concrete, oil film thickness indicators, radiometry of fluorescence, and preservation of the Declaration of Independence—showing the varied coverage of this publication. Subscriptions available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. at $1.00 a year.

Adhesion of Electrodeposits—NBS has released a paper describing a simple, inexpensive method for determining adhesion of commercial electro-deposited coatings. This technique utilizes the electrode position of an adherent, mushroom shaped nodule on the surface of the coating to act as a grip for applying a detaching force. Detaching force is then measured on spring balance. Report issued by National Bureau of Standards, U. S. Department of Commerce, Washington 25, D. C.

Electrical Contacts—A comprehensive survey of use of metals in electrical contacts originally prepared for War Metallurgy Committee has been released. Basically the report covers the substitutability of metals and alloys for contact use, and contains types and requirements of electrical contacts. Special appendix tables classify the various types of contacts, and also properties of contact metals. Request Y1 from U. S. Dept. of Commerce, Office of Technical Services, Washington 25, D. C.

Press Control—This paper discusses electrical control for hydraulic presses. Need for electrical control for hydraulic presses has come about by increased demands of industry and many new processes to which presses have been applied. Paper is complete with diagrams and illustrations discussing this type of control. Paper available from Westinghouse Technical Press Service, 306 Fourth Ave, Pittsburgh 30, Pa.

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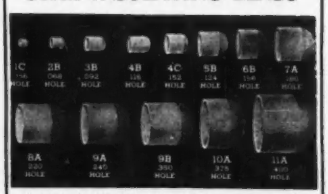

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Electric, Steam and Hydraulic Projects, Investigations, Reports, Designs and Appraisals
Chamber of Commerce Building
80 Federal St., Boston 10, Mass.

UTILITIES LINE CONSTRUCTION COMPANY, INC.

Construction and Maintenance
Transmission-Distribution
Electric and Telephone Lines
Consultants
501 York Road, Jenkintown, Pa.

W. C. GILMAN & COMPANY

Consulting Engineers
Load and Capacity Studies — Rate Cases
Financial Planning
Investigations — Reports — Supervision
55 Liberty Street New York 5

MIDDLE WEST SERVICE CO.

Practical and Experienced Consultants
20 N. Wacker Drive Chicago

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals
80 Broad Street, New York 4

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • **OPPORTUNITIES** • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of above rate, payable in advance.

PROPOSALS, $1.20 a line an insertion.

INFORMATION:

BOX NUMBERS count as 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE:

The advertising rate is $11.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. E. W.

NEW ADVERTISEMENTS received by Dec. 7th in the N. Y. C. office will appear in the Dec. 17th issue subject to limitation of space available.

Electrical
DESIGNERS
DRAFTSMEN

Experienced in industrial power distribution application. Permanent positions; liberal employee benefits, including company-paid hospitalization, life, accident and sickness insurance, pension. Please send complete resume with first letter to:

Personnel Department
THE BARRETT DIVISION
Allied Chemical & Dye Corp.
40 Rector St., New York City

EXPERIENCED

ELECTRICAL DESIGN ENGINEER

for permanent position. College Graduate, with two to four years experience in an industrial plant desired. Applicants please state age, education, previous experience and salary.

AMERICAN ENKA CORPORATION
ENKA, (Near Asheville) NORTH CAROLINA

SALES MANAGER
LIGHTING FIXTURES

Leading manufacturer of complete line of fluorescent, slimline, louvred ceiling and incandescent lighting fixtures seeks capable man to handle sales organization.

We are well established in territories coast to coast and we are only interested in man thoroughly familiar with lighting fixture field and willing to locate in N. Y. Salary plus commission.

Must have all details and references in first letter which will be held in strictest confidence. Our men know of this ad. Reply only if you meet above qualifications.

P-2546, Electrical World
330 W. 42 St., New York 18, N. Y.

ELECTRICAL ENGINEER
TO DESIGN SMALL MOTOR CONTROL SYSTEMS

A well-established manufacturer of power plant equipment is seeking a design engineer having from 5-10 years experience.

This is a permanent position with an excellent future for the right individual. Location - - - a city of about 25,000 in the Midwest.

Send full details to

P-2497, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

EXECUTIVE VICE PRESIDENT

Progressive, well established manufacturer of switching devices and controls is seeking an executive vice president with heavy engineering and production background. Must be trained engineer, electrical engineering degree preferred, and strong operating man. The man we seek is now in a broad gauged executive capacity in small electrical products. Medium size plant is located in Chicago. Salary commensurate with qualifications. This is an unusual opportunity for an aggressive producer. Replies held in strict confidence.

P-2417, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

Hot Line Tool Demonstrator to set up sales program, select and assist jobbers and manufacturers representatives in the sale of Hot Line Tools, Clamps, Temporary Grounding and allied equipment. Send full qualifications, experience record, salary desired. Submit picture with letter of application.

SW-2433, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

Corrosion Engineers

Corrosion Engineers with minimum of three or four years experience in corrosion investigations and design of cathodic protection on pipe lines and lead cables in country and city networks. Must be graduate electrical engineer (or equivalent). Work involves extensive travel, with headquarters in New York City. Only applicants with above qualifications will be considered. Give full details of education and experience, and references, in application.

P-2544, Electrical World
330 W. 42 St., New York 18, N. Y.

WANTED: Experienced Power Station Engineer.
POSITION: Assistant to Manager of Power Production with administrative responsibility of operating central stations totaling approximately 800,000 kw.
LOCATION: Pennsylvania.
ADVANCEMENT: Excellent for growth on job and promotion in near future.
EXPERIENCE: 10 years minimum, with at least 5 years in operation, maintenance or efficiency work in large modern steam-electric central station. Construction and design experience will be considered.
EDUCATION: B.S. degree in Mechanical (preferred) or Electrical Engineering from an accredited engineering college.
AGE: 30-45.
Salary commensurate with qualifications
All applications will be acknowledged. Please send personal record to

P-2130, Electrical World
330 W. 42 St., New York 18, N. Y.

WANTED

SALESMAN or AGENCY

Experienced in sale of power and distribution transformers for Chicago district

SW-1778, Electrical World
330 W. 42 St., New York 18, N. Y.

Don't forget the

BOX NUMBER

When answering the classified advertisements in this magazine don't forget to put the box number on your envelope. It is our only means of identifying the advertisement you are answering.

LIGHTING ENGINEER

Experienced lighting engineer, capable design, selection and application of lighting for generating plants, electric substations, industrial plants and office buildings. Applicant should be qualified or interested in training for handling of all technical problems related to lighting engineering. Location, New York City. Please furnish complete information including age, education and experience record.

P-2553, Electrical World
330 W. 42 St., New York 18, N. Y.

GENERAL ENGINEER
ELECTRICAL GRADUATE

Experienced in application of relays, control and power apparatus to Central Stations and Substations by established consulting organization for work in a continuing program of plant expansion for foreign public utility companies. Applicants should be capable of making short circuit, stability, calculating board studies, as well as doing a limited amount of estimating and design work and specification writing for related electrical equipment. Permanent position, location New York, limited foreign travel. Attractive salary. Splendid opportunity for right man. Reply, stating age and fullest detail of qualifications and experience.

P-2413, Electrical World
330 W. 42 St., New York 18, N. Y.

PUBLIC AUCTION

TUE., DECEMBER 11th, 10 A.M.

Consisting of the

MOTORS, TRANSFORMERS, GENERATORS, SWITCHBOARDS, POWER LINE EQUIPMENT & LINE BUILDERS SUPPLIES

ON THE PREMISES OF

PORTER *Electric Co., Inc.*

116-122 THIRD AVE. N.
MINNEAPOLIS, MINN.

PORTER ELECTRIC COMPANY will continue their other operations, including the Superior North Shore Power Co., at the same address.

The finest and most complete selection of brand new, standard, high grade Industrial Electrical Equipment ever offered at Public Sale!

WAGNER, GENERAL ELECTRIC, WESTINGHOUSE, FAIRBANKS-MORSE & DELCO MOTORS, From ¼ to 100 H.P. Also MASTER GEARED-HEAD and D.C. MOTORS.
WAGNER, WESTINGHOUSE, GENERAL ELECTRIC, ALLIS-CHALMERS & SORGEL TRANSFORMERS.

GENERAL ELECTRIC, CUTLER-HAMMER, WESTINGHOUSE & SQUARE D CONTROLS.

WORTHINGTON ELECTRIC PUMPS
SIGNAL ELECTRIC FANS AND BLOWERS
M. & E. ELECTRIC EXHAUST FANS ★ U. S. VARI-DRIVE UNITS
JEANETTE AND MASTER GEAR REDUCERS
OHMITE, CUTLER-HAMMER, AND WARD-LEONARD RHEOSTATS
GENERAL ELECTRIC AND ALLIS-CHALMERS OIL SWITCHES
WESTINGHOUSE, I. T. E. AND G. E. STANDARD AND HEAVY DUTY CIRCUIT BREAKERS
SQUARE D AUTOMATIC RESISTANCE TYPE COMPENSATORS
LABORATORY AND TEST INSTRUMENTS
WESTON, G. E., WESTINGHOUSE & ROLLER-SMITH METERS
MILWAUKEE ELECTRIC TOOLS ★ ELECTRIC WIRE AND CABLE
SWITCHBOARD WIRE, CABLE AND SUPPLIES
CROUSE-HINDS, THOMAS & BETTS, RUSSEL & STOWELL DUST TIGHT AND EXPLOSION PROOF FITTINGS AND CONTROLS.

FACTORY REBUILT, TOP QUALITY USED EQUIPMENT

SLIP RING, SQUIRREL CAGE AND GEARED HEAD MOTORS; TRANSFORMERS; GENERATOR SETS; STARTERS; COMPENSATORS; CURRENT AND POTENTIAL TRANSFORMERS; SWITCHBOARDS; METERS, ETC.

For Illustrated Descriptive Circular WRITE • WIRE • PHONE

SAMUEL L. WINTERNITZ & CO.

AUCTIONEERS • LIQUIDATORS • APPRAISERS

First National Bank Bldg. **Chicago 3, Illinois**

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

FOR SALE

1 Outdoor Type

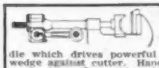
General Electric

Oil

Circuit Breaker

Catalog 2507302G2. 37 KV, 400 Ampere, Interrupting Capacity 50,000 KVA. Now in use and in First Class operating Condition.

MALLEABLE IRON FITTINGS CO.
BRANFORD, CONN.



New Electric Cable Cutter Readily portable or place in vise and use as stationary cutter. Has reversible ratchet and handle which drives powerful housed worm gear, forcing wedge against cutter. Handle is detachable and gear box can be driven from either side. High carbon steel blade — each unit equipped with extra. High-quality forged steel body. Real labor-saver. Cuts heaviest cable easily. **$9.95 PPD**

1. Original cost, $70.00
2. Max. Cap. 1 million circ. mils or 2½" dia.
3. Cuts 2½" BX and other metal covered cable
4. Wt. 11 lbs.

T & T TOOL 221 W. 2nd Tulsa, Okla.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

ASSISTANT HYDRAULIC Engineer with some field experience in construction of hydroelectric power plant projects, etc., for large Copper Company, Chile, South America. Civil Engineering graduate preferred. 3-year contract. Transportation both ways and salary while traveling paid by Company. In reply give complete details. P-2573, Electrical World.

ASSISTANT MANAGER and Superintendent—For electric and combination utility in Southwest or Northwest. Please furnish complete resume of experience, qualifications, references, and salary requirements. P-2438, Electrical World.

ELECTRICAL HEATING Specialist. Opportunity with stable, mid-western utility situated in thriving industrial area. Requires experience in promoting application of electrical heating in industrial plants. No traveling. Salary commensurate with ability. Submit resume of education, experience and personal data to P-2282, Electrical World, 520 N. Michigan Avenue, Chicago, Illinois.

MANAGER, COMBINATION Utility — predominantly electric, administrative and sales ability important, technical background desirable. Permanent position and substantial opportunity for qualified person. Replies confidential. Submit complete details including salary requirements. P-2466, Electrical World.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITION WANTED

DUTCH ELECTRICAL Engineer. Age 30. Seeks position with U. S. firm. Expert on design, repair and erection of electric machinery, including ships installations. Willing to travel anywhere, used to working with native labor. Sr. G. Visser, Newport, Curacao, N. A.

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR. Bureau of Reclamation. Sealed bids (Invitation No. DS-3590) will be received by the Bureau of Reclamation, Denver, Colorado, until December 27, 1951, and then publicly opened for furnishing two 20,000-kva, 6,600 delta- to 115,000 grounded wye-volt, 3-phase, 60-cycle, oil-immersed, forced-oil-cooled, outdoor power transformers with air-cooled external heat exchangers for Eklutna Power Plant Switchyard, Eklutna Project, Alaska. Delivery is desired within 730 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

WANTED

Three 250 or 333 KVA OISC Transformers

1 phase—60 cycle—13,200 Volts Primary—440 Volts Secondary—Recent Manufacture.

W-2568, Electrical World
330 W. 42 St., New York 18, N. Y.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	7500	G. E.	138000—41000, 3 ph.
3	3333	West.	132000—7620/13200 Y
4	2000	West.	69000—13800
4	2500	West.	44000—11000
3	1500	Wag.	44000—6900 NEW
3	200	Mol.	44000/22000—440/220
3	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
3	8333	West.	43800—13900
1	18750	A.B.B.	34840—11000, 3 ph.
6	1500	Pitts.	33000—2400
3	200	West.	33000—7200/12470 Y
4	150	G. E.	33000—7200/12470 Y
3	100	A. C.	33000—7200/12470 Y
3	75	Mol.	33000—2300/6900
3	75	Wag.	33000—7200/12470 Y
3	50	G. E.	33000—2300/4000 Y
3	50	Kuhl.	33000—7200/12470 Y
4	450	A. C.	25410/44000—13280/23000
3	50	West.	22000—2300
2	667	Pitts.	13200—2200
3	200	Mol.	11000—2300
3	150	Mol.	7620/13200 Y—120/240
3	667	Kuhl.	7200/12470 Y—2400
3	100	West.	7200/12470 Y—2300
4	50	G. E.	7200/12470 Y—2300
3	75	West.	6600—460/230
1	100	G. E.	2300—575, 3ph.

INDUCTION REGULATORS

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
2— 45 KVA West. 200/400 A. 2300 V.
6— 36 KVA G. E. 150 A. 2400 V.
2— 36 KVA G. E. 75/150 A. 4800 V.

CIRCUIT BREAKERS

4—600 A. 154 KV G. E. FHKO—39—2500 MVA
1—600 A. 73 KV G. E. FHKO—236—500 MVA
1—400 A. 37 KV G. E. FHKO—136—250 MVA
1—400 A. 37 KV West. O—221—500 MVA
1—400 A. 15 KV G. E. FKO—37—40
4—600 A. 15 KV G. E. FHKO—139—750 MVA

BREW, WOLTMAN & CO., INC.
52 Church St., New York 7, N. Y.

TRANSFORMERS
FOR SALE

1 Phase, 60 Cycle

3—500 KVA G-E 66000—2300
2—500 KVA W-H 13200—240/480
3—400 KVA W-H 13200—600/575/550
1—400 KVA G-E 13200—120/240 Pyranol
3—333 KVA G-E 44000—6600
3—250 KVA W-H 13800—2300
3—200 KVA G-E 13200—120/240
3—250 KVA Kuhl 6600—575
3—150 KVA G-E 44000/33000—2400/500
3—150 KVA Pitts 22000—575
3—150 KVA G-E 19050/33000Y—2540/2300
3—150 KVA A-Ch 13800—2300
3—100 KVA G-E 33000—6900/11950Y
3— 50 KVA G-E 33000—2400/4160Y
3—100 KVA G-E 2400—240/480, 25 cycle

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
CINCINNATI 27, OHIO

WORLD'S LARGEST INVENTORY

MOTORS—GENERATORS—TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.
ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1—	6000	Al. Ch.	Condensing 200/250 I.S.P. 2300 v. 3/60 Exc. & Surface Cond.
2—	750	G.E.	Condensing — 425 lbs. 750 TT. I.S.P. 440V. 3 ph. 60 cy.—Built 1944
1—	500	Moore	Non-condensing, 150/200 lbs ISP 5/35 lbs. G.B.P. 3/60/480 volts Direct Connected Exciter
1—	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1—	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

	KVA	Make	Type	Volts	Speed
1—	5000	Whse.		2400/4150	600

MOTOR GENERATOR SETS

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E.	500	666 25 cy.	11000
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
1—	1000	G.E.	900	260	4160-600 0
2—	500	Whse.	900	250	6600/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150
1—	240	G.E.	1200	250	2300
1—	150	G.E.	1200	275	2300
1—	150	Whse.	1200	275	2300
1—	140	Cr. Wh.	690	125/250	2300

TRANSFORMERS—60 Cycle

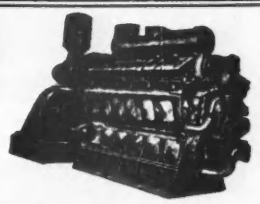
	KVA	Make	Type	Ph	Voltages
1—	4000	G.E.	HT	3	22000-12300
3—	1500	Pitts.	OISC	1	22000/2300
3—	1250	G.E.	HVDDJ	1	6600x2550
3—	900	A.C.	OISC	1	13200/2300
6—	300	G.E.	HT	3	2400x240/480

BELYEA COMPANY, INC.

OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

DIESEL POWER
FOR IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA
A.C.—50 AND 60 CYCLES
VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	33F16	2000	200	275	Enterprise	DSC—6	450	450
1420	Fairbanks Mors	38D8½	1600	720	330	Superior	KNA	300	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1080	720	312	Clark	MD—4	375	327
625	Alco	6-12½x13T	750	600	125	Ingersoll Rand	S	225	514
425	Baldwin	VO—6	410	450	187	General Motors	8-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6045C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd ST. NORTH BERGEN, N. J. N.Y.C. Tel. LOngacre 5-3727 N. J. Tel. UNion 3-2600

TRANSFORMERS

1—1500 KVA Whse., 3 Ph., 33,000/66,000-240/480V, HT taps
3—1500 KVA Pittsburgh, 1 Ph., 22,000-2200V
1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
2—400 KVA Pittsburgh, 1 Ph., 2400/4600-240/480 Scott-Taps
3—400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1—200 KVA G.E., 3 Ph., 2400-220 Sec.
2— 50 KVA Whse., 1 Ph., 2400V 120/240 Inertean
5— 50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.

SYNCHRONOUS MOTORS

1—300 H.P. Elec. Mach. 720 RPM., 3 Phase 60 cyc., 2200V. Totally Enclosed Fan Cooled Outdoor service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM, 4000V Syn.
1— 200 KW Whse., 275V, 900 R.P.M., 220 V. Exc.
1— 175 KVA West., 1 Ph., 220V., Motor 3 Ph., 400V.
1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1— 75 KW., 250V, 1200 RPM., 2400V. Syn.

SLIP RING MOTORS

1—2500 HP G.E., MT. 257 RPM 6600V.
1— 250 HP West., CW., 600 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2200V with D.C. Exc

Large Stock of A.C. and D.C. Equipment

DIESELS—FOR SALE

2—1250 HP, 4 cycle, 164 RPM Macintosh-Seymour diesel engines driving 850 KW, 2 phase, 2300 volt, 60 cycle generators (can be rewound 3 phase). Units now in Central Station operation, probably available May 1952. Contact Commissioner of Public Utilities, Rockville Centre N. Y.

FOR SALE

1—**GENERAL ELECTRIC** Three-phase, 2300-volt, 80 KVA 5/10% **INDUCTION VOLTAGE REGULATOR**. Type IRT-2 Ser. 4006852.
2—**WESTINGHOUSE** Three-phase, 2300-volt, 86 KVA 10% **INDUCTION VOLTAGE REGULATORS**. S.O. 27M12 Ser. 8024656 and Style No. 57C318 Ser. 4703075.

FS-2406, Electrical World
330 W. 42 St., New York 18, N. Y.

FOR SALE

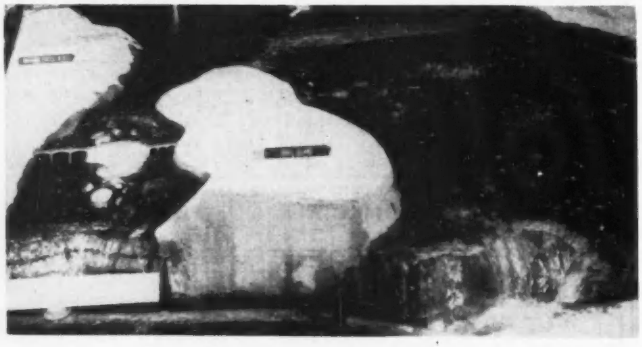
One Fulton Iron Works 500 H.P., Class 5-G, 5 cylinder, 200 R.P.M. diesel engine Serial No. 1236, complete with auxiliaries and Westinghouse 3 phase, 60 cycle, 425 K.V.A. generator and direct connected exciter.

This unit in now operating in our Liberal, Kansas, plant. It may be inspected at any time.

Bids should be mailed to

WESTERN LIGHT AND TELEPHONE COMPANY, INC.
P. O. Box 763 Great Bend, Kansas

LETTERS TO THE EDITOR



NIAGARA FALLS in miniature, as built by Niagara Falls Power Co (above) and Corps of Engineers (below), permits study of use of water for power purposes

Who Will Make It Three?

To the Editor:

The picture of the Army Engineers' model of the Niagara River and Falls, which appears on p 6 of the October 29 issue of Electrical World under "Hydro Project Looking for a Builder," made me wonder whether you had ever seen the model which Niagara Mohawk Power Corp built in 1929.

W. A. Lyons
Vice President

New York State Electric
& Gas Corporation
Binghamton, N. Y.

Editor's Note: A description of a model of Niagara River and Falls, built under the direction of J. L. Harper of Niagara Falls Power Co, was carried in Electrical World, June 28, 1924, p 1345. Niagara Falls Power Co now is a subsidiary of Niagara Mohawk Power Corp. It is interesting to note that the model was built for the dual purpose of demonstration and experimentation and its use was offered to anyone who had an idea concerning increased diversion of water for production of electric power without any decrease in scenic beauty of the river and falls.

Right Utility, Wrong State

To the Editor:

We call your attention to an item on p 108 of the October 8, 1951 issue of Electrical World headed "Line Crew Saves a Life." The scene of the action is given as Dayton, Oregon, and the "keen eyes and quick action" are attributed to a Pacific Power & Light Co line crew.

The item stirs our interest because Portland General Electric Co serves Dayton, Oregon, and considerable surrounding territory, and we wonder if your sources of information could possibly be in error as to the correct utility name. We have checked with our own crews who normally work in the Dayton area and have found that they have no knowledge of such an incident.

Jim Goggin
Press Representative
Portland General Electric Co
Portland, Oregon

To the Editor:

Everything is on the up and up in the item to which Portland General Electric takes exception. . . Our lads actually did save a motorist's life as the story said but it was in Dayton, Washington.

R. K. Foley
Advertising Manager
Pacific Power & Light Co
Portland, Oregon

Others Make ACSR Also

To the Editor:

In the Engineering Reference Sheet, p 142, November 5, 1951, we notice the term ACSR is credited entirely to American Steel & Wire Co. This is misleading because ten or more companies now make ACSR. It was Alcoa, however, which made the first sale of ACSR more than forty years ago . . . ACSR was never registered as a trade name but has become standard nomenclature.

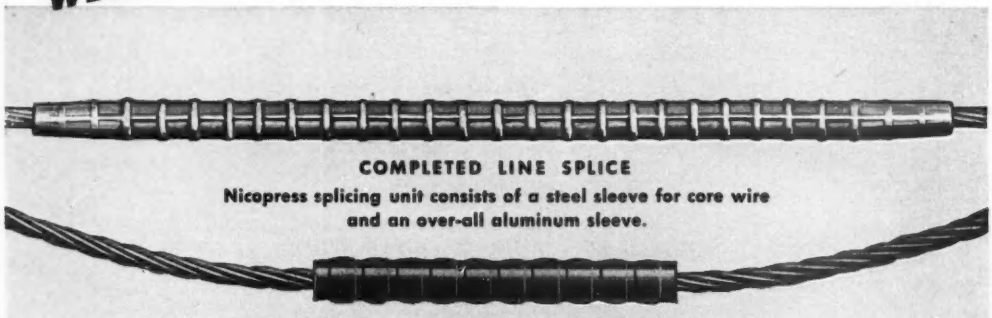
Robert F. McGeever
Aluminum Company of America
Pittsburgh 30, Pa.

Editor's note: We should have known better.

Nicopress SLEEVES

for A·C·S·R·

WILL GIVE YOU PEAK PERFORMANCE!



COMPLETED LINE SPLICE

Nicopress splicing unit consists of a steel sleeve for core wire and an over-all aluminum sleeve.

COMPLETED JUMPER SPLICE

REPAIR SLEEVE
(Partially Completed)

Nicopress is the Registered Trade Mark of The National Telephone Supply Company

The National Telephone Supply Company

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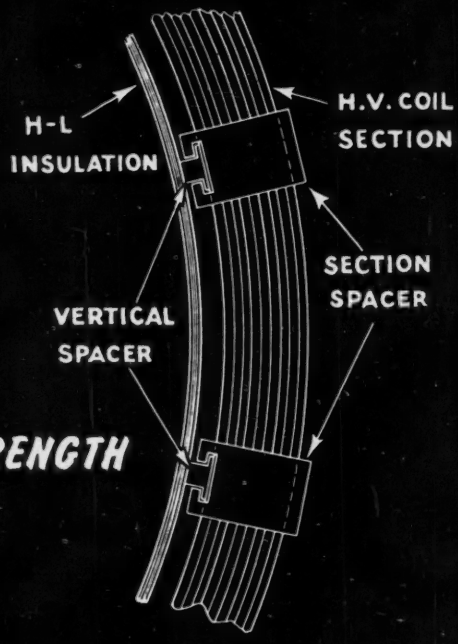
Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

IT'S A FACT:

KUHLMAN LOCK SPACERS ASSURE GREATLY INCREASED COIL CONSTRUCTION STRENGTH FOR POWER TRANSFORMERS!



The Kuhlman lock spacer is a permanent connection between the section spacer and the high-low insulation barrier which supplies a firm, solid rigidity to the coil structure. No tape or other material of a temporary nature is used in the Kuhlman connection. Thus, there is no chance of coil sections in Kuhlman Power Transformers working loose from the expansions and contractions of operating temperatures.

A small item? Perhaps. But consider the consequences should coil sections work loose and come in contact with each other. That is a situation only costly repair time can correct. And it **can't** happen with Kuhlman Power Transformers—thanks to Kuhlman lock spacers.

It is close attention to small details like this which has kept Kuhlman among the leaders in the transformer industry for well over half a century. Keep it in mind the next time you buy power transformers. In the meantime, write for Kuhlman Bulletin CS-601, on Kuhlman power units.

Kuhlman ELECTRIC COMPANY, BAY CITY, MICHIGAN

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,* 67 Broad Street, New York 4, N. Y. Cable Address, Microphase, N. Y.

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